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THE DISTRIBUTION OF LEPROSY IN NORTH AMERICA.[1]

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In an attempt to discuss within the limits here set the questions connected with the distribution of leprosy in the northern part of this hemisphere, it is expedient at the outset to simplify the terms involved. By the designation, lepra, it is here intended to refer exclusively to that complexus of symptoms to which the title has, up to within a relatively recent date, been restricted in the annals of medicine. Aggressive attempts have lately been made to identify as among the manifestations of leprosy, syringomyelia, Morvan's disease, scleroderma, morphœa, Raynaud's disease, ainhum, and some other affections. These, it is averred, are symptoms of an attenuated form of the malady occurring in the races best fitted by inheritance and development to resist the graver incursions of the plague. These views, not being as yet established by sufficient evidence, may be for the present purpose dismissed from consideration.

But some at least of the time-honored distinctions established by authors in this field may be now with safety set aside. The tubercular, anæsthetic, macular, mutilating, and mixed forms of lepra should figure no longer in the statistics of the disease. They are not varieties, but different external expressions of one and the same malady, often simultaneously shown in a single patient.

The bacilli of lepra have travelled from their home in Asia to the

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American continent, eastward and westward, in two distinct armies of invasion.

That advancing to the West divided into two companies, unequal in size, on the Syrian shores of the Mediterranean. Of these, the smaller division passed northward to attack Norway, Iceland, and Greenland; the vaster number straggled in an irregular line to the southward over Egypt, and southern and western Africa.

The northern germ colony, somewhat attenuated by reason, perhaps, of the vast wastes of cold seas traversed, ranged toward the northern boundaries of this hemisphere, along the shores of the St. Lawrence River. The southern colony, finding a more congenial soil and climate in Brazil and Guiana, multiplied and strengthened till their outposts had spread as far to the north as the West Indies and Mexico.

A single line of invasion was observed from Asia to the western coast-line of this country. It extended directly from China, through the Samoan and Hawaiian Islands, to the seaboard of North America.

The prevalence of leprosy on the Sandwich Islands, in consequence of their commercial proximity to this country, has attracted the attention of medical men and others since the year 1830, when it is believed the first authentic case was recognized. At the settlement in Molokai, there are at the present date 1142 lepers. As to the number at large, the health officers of Honolulu believe that it is not great, as a consequence of a recent and carefully executed examination of the people in the several islands of this group.

Finally, through the Port of the city of New York, with its innumerable maritime connections, a door has been open to the immigration of the germ-carriers of this disease from every country of the globe.

In studying the distribution of leprosy in North America, after its introduction by the several routes thus recognized, several interesting facts are readily established. First, that with respect to the spread of the disease, the northern has suffered far less than the southern portion of the American hemisphere; second, that the prevalence of the disease, even in this latter portion, is far greater in the southern than in the northern provinces; third, that, as compared with other continents afflicted with the disease, North America suffers to-day less than either Asia or Africa; and, lastly, that if Mexico and the other countries south of the border line of the United States be not considered in the comparison, the relative prevalence of the disease in British America and the United States scarcely differs from that of all Europe, if Norway be excluded.

With respect to the distribution of leprosy in British America, I have arranged with my colleague, Dr. J. E. Graham, of Toronto, Canada, to report fully upon this part of the field. It appears from the records that about two hundred and fifty lepers have been cared for in the province

of New Brunswick since the year 1815. Dr. Graham will show that that there are probably not more than thirty lepers living to-day in that whole region.

The Consul-General of the United States in Havana, under date of the 20th of March, of the present year, sends me a communication from Dr. Daniel M. Burgess, Sanitary Inspector of the Marine Hospital Service, reporting that more than eighty male and female lepers are inmates of the Leprosy Hospital of Havana; and that the prominent physicians of that city estimate that there are more than that number living at large in the town. Infected individuals are known to be living also in Puerto Principe, Santiago de Cuba, and in every town of considerable size on the island. A low estimate, therefore, would allot between 300 and 500 lepers to Cuba alone. As to the segregation of the victims of the disease, if there be any laws providing for the same, they are in that country a dead letter.

In the Lepers' Home of the island of Jamaica, there were, at the date of the last report, eighty-six subjects of the same disease, the total number historically registered being between 700 and 800. Reports from the island of Trinidad enumerate 212 lepers at date of last report (*loc. cit.*), the estimated number for the entire island being 481. In Barbadoes there are between sixty and seventy; in Antigua, twenty-one; in Guadaloupe the disease is reported to be "endemic." The exact number of cases in St. Kitts, Nevis, and St. Vincent, where it is known to prevail, is undetermined. As a rule, there is no isolation of lepers in the British West Indies.

Turning to the main coast, the average number of lepers in the Lazaretto of the City of Mexico is thirty. The disease, which is here known as the "Mal de San Lazaro," has existed in the country since the conquest by Cortez; and outside of the capital of the republic and especially in the western regions it prevails, but to an extent not known. The Mexican authorities, however, believe that leprosy is at the present time not extending.

Numbers of lepers are seen in Panama by travelers in that country; but here, as in some other of the States of the southern portion of North America, statistical figures are not accessible. The disease is sparsely scattered in the mountain regions of Costa Rica, and also in Nicaragua, Honduras, and Salvador. The same is true of Guatemala, but in that country attempts have been lately made to insure strict segregation of the infected.

The United States of America has thus been exposed to incursions of leprosy from each of the four principal points of the meridian—from the north, from the south, from the east, and from the west. That the total result up to this date has been relatively insignificant has been due, not to a wisely directed vigilance, nor to barriers erected by science. It has

been owing rather to the accident of the general excellence of the habits, of the resources, and of the environment of our people.

At this date the distribution of lepers in the United States cannot be determined with accuracy, either for the present or for the past. Some of the reasons for this unfortunate fact are these:

1. The United States Government has neglected its obvious duty in this matter. It is admitted by the authorities that the figures representing the number of lepers in the country, collated at the date of the last census, have not yet been compiled; that it is doubtful whether they ever will be compiled; and that even if so compiled, the result would be so incomplete and unsatisfactory as to possess but little value.

2. The authorities in but a few States have taken the needful steps in the proper direction.

The State Boards of Health of Maine, Pennsylvania, and California, require the reporting to them of all cases of the disease. Segregation or isolation of lepers is required by law in Pennsylvania, New York, and Wisconsin only. In Pennsylvania and California the county authorities provide for the maintenance and medical care of lepers. In Minnesota the infected are registered and kept under observation, but not segregated. These local and insufficient attempts to regulate a disease threatening the population of forty-nine States and Territories of the Union, illustrate well the uncertainty that exists respecting its geographical distribution within our borders.

3. In the absence of a trustworthy official collation of facts, it is well known that the families of lepers here, as in other countries, as a consequence of fear or shame, or for other reasons, often wilfully conceal, so far as they are able to do so, the existence of leprosy in one or more of their number.

4. Many of the general practitioners of the United States are so unfamiliar with leprosy that they are unable to recognize it when confronted with it. This is not set down as a reproach, but as a fact based upon their own admissions, and an experience in recognized cases. This unfamiliarity with the disease, due to the infrequency of its occurrence in practice, has an unfortunate issue in two directions as respects the clouding of the question under consideration. It involves, first, the occasional non-recognition of the infected leper; it also, at times, results in affixing the stigma of that disease upon patients with formidable evidences of a malady due to some simpler cause.

5. Among the cases of leprosy reported by wholly competent men as existing in different parts of the country it is often difficult to determine whether one or more patients do not also appear in other reports, the figures being thus duplicated to confusion. For many reasons it is often unwise and cruel to identify lepers by their individual names in reports of this kind.

6. The chances of embodying a single case in two or more separate reports of competent physicians is greatly enhanced by the movement of some leprous patients from one part of the country to another. In the Orient, the leper is usually a pauper—a deformed and repulsive object of charity by the roadside. The United States, however, enjoys the unenviable distinction of being the one country where some of its lepers have the ability and opportunity to travel from one point to another—at times in a Pullman car, and often with a liberally provided purse. The following travels of lepers in and across the Union are cited merely as illustrations of this fact; all are substantiated by well-known details: Six trips from New York to San Francisco; seven from San Francisco to New York; one from San Francisco to Chicago; three from Chicago to New York; one from Nebraska to Illinois; one from Florida to Illinois; one from Chicago to St. Louis; one from New York to Florida. One of the Chicago lepers decided to visit for awhile his home in Sweden. He left the American city, crossed the ocean, passed through Stockholm on his way to his native village, retraced his route, and finally returned to Chicago, where he died one year later of his disease.

The credit of first collecting statistics as to the number and location of lepers in the entire country is due to the American Dermatological Association. Long before the subject had become the favorite theme of the sensation-monger upon the lecture platform, in the magazines, in the daily press, and even in the pulpit, this Association, under the painstaking leadership of its first President and first chairman of its Statistical Committee, Dr. James C. White, of Boston, began its investigation of this field. In the year 1878, a twelvemonth after the date of its organization, it published its first *Report of the Statistics of Cutaneous Diseases in America*, and in this report were included three new cases of leprosy, with detailed returns of the number of cases of lepra in Maryland, South Carolina, Georgia, California, Minnesota, New Brunswick, and in the Hawaiian (Sandwich) Islands. Since then the Association has collated a total of 204,860 cases of skin disease, including 56 cases of lepra; the percentage being 0.022. These figures do not, of course, represent the number of lepers in the United States, but only the number under observation of the experts represented in the membership of this body, or those reported directly to them.

Beginning, then, with these figures as a basis, there can be added to them the observations made by intelligent members of the profession connected with State Boards and Health Departments, as well as those of trained physicians, competent by education and experience to establish a correct diagnosis of leprosy. Most of their names appear in the bibliography appended to this report, which includes a list of more than one hundred and twenty papers, for the most part touching on leprosy in America, and contributed by American authors. It is scarcely need-

ful to add that in the compilation of reported cases it is proper to give large credit to the work done by such well-known American writers on the subject as Dr. H. S. Orme, of San Francisco; Dr. C. Grönvold, of Minnesota; Dr. N. W. Blanc, of New Orleans; Dr. Benjamin Lee, of Philadelphia; Drs. Allen, Morrow, and Piffard, of the city of New York; and Dr. W. H. Geddings, of South Carolina.

It may thus be approximately determined that the cases of leprosy heretofore recognized in the United States have been distributed as follows: In Arkansas, 3; in California, 158; in Dakota, 2; in Florida, 6; in Georgia, 1; in Idaho, 2; in Illinois, 13; in Indiana, 2; in Iowa, 20; in Louisiana, 83; in Maryland, 4; in Massachusetts, 5; in Minnesota, 120; in Missouri, 2; in Mississippi, 2; in New York, 100; in New Jersey, 1; in Oregon Territory, 3; in Pennsylvania, 6; in Utah, 3; in Wisconsin, 20—a total of 560.

Thus much by way of an approximate estimate of the number of lepers which have been at one time or another upon the soil of the United States. In attempting to indicate upon a map the proportion and distribution of these cases, by placing dark spaces within the outlines of those States respectively where they have been observed —the size of the spaces in each being proportioned to the number of cases—it becomes evident at a glance that the geographical proximity to a colony of lepers, of any point in this country where the population is relatively small, is of less importance as respects an accumulation of cases than is commercial activity between widely distant populous centres whose intercourse is by maritime traffic. Thus the southernmost point of Florida, which has been for at least half a century nearest a large leper colony, has harbored far fewer cases than has either San Francisco or New York. The numbers represented in a group of the Northwestern States illustrate the tide of settlement of Scandinavians deflected around the great lakes in their transit from New York to a country and climate approximated to that of the Swedish and Norwegian peninsula.

It is a much more difficult task to form even an approximate estimate of the number of lepers living to-day on the soil of this country. Under date of the 13th of March of the present year Dr. H. R. Brown, of the Health Department of the city of San Francisco, reports that there are but eleven lepers in the pest-house of that city: two from Hawaii, one from Finland, one from Mexico, one from Madras, and six from China. Dr. J. R. Laine, of the California State Board of Health, supposes that there are perhaps fifteen others in the entire State. This would give a total of twenty-six cases in California; and, in the view of the same authority, there has been no increase of the disease there in recent years. The proportion of these cases to those altogether reported from that State, 158 in all, may be, for the purpose of approximate estimate,

observed from some of the other figures collated. In this way it may be computed that there should be ninety-two lepers now alive in the country. There are actually two lepers in Florida; and usually from one to three in Illinois, and the same number in New York. One is known to be in Texas, two in Idaho, two in Pennsylvania, four in South Carolina. There are probably more than threescore of lepers in Louisiana, and less than half that number in the States of the Northwest named above. This suggests an approximate estimate of between one hundred and two hundred cases of leprosy. Competent observers have estimated that the total number is between ninety and one hundred and fifty. It can scarcely be doubted that in each of the last fifteen years there have rarely been fewer than one hundred lepers living within the territorial borders of our country.

These figures are to be viewed neither with the hysterical alarm of the timid nor with the careless indifference of the unwary. They call for intelligent discussion and for a wise provision, alike for the need of the unfortunate leper and for the safety of the community in which the infected are now living. There are greater problems presented to the physicians of America than those growing out of these interesting statistics. Tuberculosis alone exposes at present, to a greater danger than lepra, the health of our population. But enough lepers are now sheltered upon this soil to offer a menace to the welfare of its inhabitants and to propose a problem in State and sanitary science which I believe the General Government alone can rightly solve.

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THE DIAGNOSTIC FEATURES AND TREATMENT OF LEPROSY.

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The clinical picture of leprosy drawn by many of our text-book writers is that of a disease as readily recognizable by its typical features as it is repulsive by its hideous deformity. This common conception is derived from examples or representations of the disease in its fully developed or final stage. With its initial manifestations and the varied

[1] Presented before the General Session of the Congress of American Physicians and Surgeons, Washington, May 30, 1894.

phenomena exhibited in the earlier stage of its evolution, few medical men in this country are familiar. While it is undoubtedly true that the clinical features of a case of leprosy typical in its development and advanced in its evolution are so striking and characteristic as to be absolutely pathognomonic, it is equally true that in its earlier stages, and even in fully developed cases with atypical manifestations, there is no disease in the entire domain of pathology more difficult of recognition. It is precisely this latter class of cases which have a most important relation to the general subject now under discussion. Leprosy in this country is essentially of exotic origin, and Dr. Hyde has told you that the vast majority of lepers in North America are imported cases. Dr. White will doubtless urge the establishment of a rigid quarantine against the immigration of lepers as the most effective prophylactic measure. In the writer's opinion, however, no system of quarantine can be instituted sufficiently searching and rigid to exclude a disease so little manifest on ordinary examination as leprosy.

Mr. Jonathan Hutchinson states that on the occasion of a visit to the Leper Hospital in Norway, he examined a number of the inmates who appeared to him perfectly well. Asking to be shown the means by which identification was arrived at, little brown patches, sometimes a single patch on the limbs, were pointed out, which were anæsthetic in their centres. Referring to the efforts then being made by the United States authorities to prevent the ingress of lepers, by the inspection of all Norwegian immigrants before they were allowed to land, the Bergen physician said: "They only recognize bad forms, and these but seldom go over; they don't know such cases as these."

It will be my object in this paper to consider more especially the diagnostic signs of the disease at an early stage, when they are so little manifest on ordinary examination as to escape identification.

The difficulties which attend the diagnosis of leprosy depend upon its prolonged period of incubation, the absence of any initial lesion that might connect it with a known exposure, the indeterminate character of its prodromal symptoms, and, finally, the multiplicity and variety of its manifestations. The fact that leprosy is essentially a proteiform malady is not sufficiently appreciated. While syphilis may surpass it in the number and variety of its eruptive elements, the cutaneous manifestations of leprosy most accurately imitate many of the ordinary dermatoses. This imitation is carried into the realm of neuro-pathology; nerve leprosy simulating most deceptively the manifold forms of neuritis of toxic, traumatic, and constitutional origin. The earlier manifestations of leprosy, unlike those of syphilis, are in no sense "specific" or peculiar to the leprous process; there is nothing regular in their mode of evolution, nothing constant in their appearance, nothing distinctive in their morphological characters; they are so variable, uncharacteristic, and

absolutely indefinite, that they would never be ascribed to leprosy in any country where the disease was not endemic, or there were not decided reasons for suspecting its presence.

As is well known, the lesions of leprosy chiefly affect the skin and nerves, and according to the determination of the morbid process toward the cutaneous or nervous system, two principal forms are recognized.

The prodromal symptoms of the *tubercular form* possess but little diagnostic value; they may be so slight as to escape recognition. The malaise, general debility, vertigo, digestive disorders, fever, etc., are common to other diseases. The febrile movements, formerly ascribed to cold, damp, or malaria, we now recognize as due to the invasion of new parts of the body by the bacilli, and the toxic effects produced by their emanations.

The prodromal symptoms of the *anæsthetic* form are much more variable, and quite as uncharacteristic. They consist chiefly of disorders of sensation, hyperæsthesia, formication, pruritus, and sensations of burning, tingling, and numbness. The pain and motor weakness often present are ascribed to rheumatism or neuralgia. In both forms symptoms referable to changes in the mucous membranes of the upper air-passages, slight hoarseness, rhinitis, epistaxis, etc., not infrequently precede the outbreak of any eruptive accident.

The first objective signs of leprosy are usually manifest in the form of erythematous spots or patches of variable size, shape, and color. These spots almost invariably make their first appearance upon exposed parts, the face, hands, and feet; later they become more generalized. The exanthem sometimes resembles that of the eruptive fevers. I have recently seen a case in which the initial rash had been diagnosticated as measles, from which it was differentiated by its persistence. For three years it faded and reappeared a number of times in the form of erythemato-papular lesions, before the charcteristic tuberculation took place. Still another, in which the right side of the forehead and cheek was occupied by slightly raised erythematous patches of a sombre-red color, simulating perfectly lupus erythematosus. In the tubercular form the spots may come and go a number of times before remaining permanent or becoming the seat of tubercles. They are to be differentiated from the lesions of exudative erythema and the macular syphilide by their localization and their slower involutive changes.

The erythematous spots of the anæsthetic form are characterized by their permanence, their tendency to clear in the centre while spreading peripherally, their achromic changes, and later, by their anæsthetic centres. They are to be distinguished from the patches of chromophytosis, morphœa, and vitiligo.

Months or years may intervene between the first appearance of leprous erythema and the development of tubercles. The tubercles, which constitute the most specific sign of this form, may develop upon the erythem-

atous patches, or upon previously clear surfaces. They vary in form, color, consistence, and in size from a pin-head to that of a small nut. The tubercles may remain stationary or progressively enlarge. After their full maturity they may undergo spontaneous resorption and reappear a number of times. They may soften and break down, forming shallow or deeper ulcers, or they may undergo a fibrous induration into small hard masses, which persist indefinitely. They may be discrete or aggregated in patches. Their seats of predilection are the facial mask and the extremities, but they are not confined to these regions. Situated along the external malleolar region and in front of the leg, they bear a most deceptive resemblance to the nodules of erythema nodosum. When small they have been mistaken for the papules of lichen planus, acne indurata, rosacea and sycosis. When larger the tubercles may resemble the tumors of molluscum fibrosum, sarcoma, carcinoma, mycosis fungoïdes, syphilis, and lupus vulgaris.

The diseases with which leprosy is most apt to be confounded are syphilis and cutaneous tuberculosis, with which it shares the pathological peculiarities of cell infiltration of the connective tissues, followed by disintegration of the morbid products and ulceration.

The lenticular tubercles of leprosy resemble absolutely the small papular syphiloderm. The tubercular syphilide, which bears the most deceptive resemblance to leprosy, is distinguished by the more rounded contour of the lesions, their development in circular or crescentic forms, their absence from the lobes of the ears, and their more general distribution. The ulcers of syphilis are more rounded, more superficial, and more circumscribed in extent. The ulcerations of leprosy do not present a serpiginous mode of extension. Lupus is distinguished by its occurrence in the form of isolated patches, and its more limited localization. In all doubtful cases of tubercular leprosy, the demonstrable presence of the bacilli in the tissues or liquid exudates establishes the diagnosis.

An early manifestation of the anæsthetic form is a bullous eruption, which may even precede the erythema. It is to be distinguished from pemphigus vulgaris. Frequently the first indication of the disease, especially in children, is the existence of burns, scalds, or other traumatisms which the patient has received unconsciously. In tropical countries where patients go barefoot, the so-called plantar ulcer is often an early sign.

The phenomena of nerve leprosy are essentially those of multiple neuritis; they consist of hypertrophy and nodular infiltrations of the nerve cords, readily recognizable in the ulnar and peroneal nerves, paralyses of special nerves, with atrophic and degenerative changes of the muscles, giving rise to contractures, and the peculiar "bird-claw" deformation of the hands. Anæsthetic leprosy has been mistaken for progressive muscular atrophy, arthritis deformans, hysterical paralysis, mutilating

scleroderma, Raynaud's disease, syringomyelia, etc. The lesions of the bones and joints, with the mutilations and deformities which commonly occur in the advanced stage, can scarcely be confounded with the clinical picture of any other disease. As the bacillus cannot be demonstrated in the lesions of nerve leprosy, anæsthesia constitues the most important diagnostic feature of this form. Since leprosy is exclusively human in its origin, the history of known contact with a leper, or of residence in a leprous country, is of great diagnostic worth.

In this necessarily brief sketch, I have been compelled to pass over the leprous manifestations of the mouth, nose, and throat, the ocular lesions, the changes in the cutaneous glands, the alopecia, the visceral complications, and other pathological coincidences which furnish important diagnostic indications. Want of time also forbids more than a passing allusion to those *atypical* forms of the disease in which a deviation from the normal plan of evolution introduces an element of confusion. While as a rule the lesions of leprosy are more or less symmetrical, cases are met with in which the manifestations are strictly unilateral. I have had under observation a case in which twelve years after infection the only symptoms were dystrophia and anæsthesia of the right hand, forearm, and ankle; another of ten years' duration, in which the manifestations were limited to three or four erythematous patches with anæsthetic centres on the left side; still another, in which the sole signs of the disease were a single tubercle on the right cheek, and anæsthetic changes in the right hand.

TREATMENT.—It would be presumptuous in a medical man living in a country where leprosy is not endemic, to formulate conclusions as to its treatment based upon his own necessarily limited experience. For results possessing definite value, we must rely upon the clinical experience of competent medical men living in leprous countries, who have had opportunities of testing remedies on a large scale and during a long period. Unfortunately, this clinical testimony, instead of being conclusive, is of the most conflicting and contradictory character.

In estimating the value of treatment certain possible sources of error should be considered. The study of the natural history of leprosy, abandoned to its own evolution and uninfluenced by treatment, shows that it does not pursue a progressive, uninterrupted course: the morbid process alternates between activity and repose; it often presents remissions sufficiently prolonged and complete to give deceptive indications of a cure. It may be formulated as a general law that recessions are the rule in leprosy, especially in the earlier stages. If a remedy happens to be given when such a remission is about to occur, the observer is apt to attribute the spontaneous subsidence of symptoms to the treatment employed. On the other hand, if the treatment is instituted coincidently

with an exacerbation or new outbreak, it is condemned as a failure. In the writer's opinion, the claims of most of the remedies which have been vaunted as "specifics" in leprosy, are largely based upon *post hoc* conclusions as to results, which, rightfully interpreted, are mere coincidences.

Without passing in review the vast number of drugs and methods of treatment which have been employed, we will glance at the clinical testimony in regard to a few which at the present day are most in repute.

Chaulmoogra oil perhaps ranks highest in professional esteem. It is claimed by Beaven Rake and most European observers, that under its prolonged use discolorations clear up, leprous nodules undergo involution, ulcers heal, and there is a notable amelioration of all symptoms, while Bidenkap, Daniellsen, and other experimenters have been disappointed with its results. Of gurjun oil, which enjoys such a high repute in India, Hillis states that it is a most valuable agent in all forms of leprosy, exercising a specific action upon the sweat glands, evidenced by increased perspiration and return of sensation in the anæsthetic areas. This opinion is concurred in by many of the civil surgeons in India. On the other hand, Drs. Beaven Rake, Vandyke Carter, and others, depreciate its value, declaring that the results are disappointing. Salol, so highly extolled by Lutz in arresting the leprous fever, causing the eruption to disappear and the ulcers to heal, is as strongly condemned by Dr. Cook, Superintendent of the Leper Hospital in Madras, who, after an extensive experience, declares: "Salol is, in my opinion, of no therapeutic value in leprosy; in fact, a decided failure." So with the entire list, salicylic acid, carbolic acid, creosote, crude petroleum, the sulpho-ichthyolate of ammonium, arsenic, etc.: highly praised by some observers, they are by others, equally competent, condemned as useless or harmful.

We thus perceive that among men who have had the largest opportunities for experiment, there is a most woful lack of unanimity as to the value of any of these various remedies.

In this country and Europe the therapeutic problem is complicated by the modifying influence of climate upon the course of the disease. It is a matter of observation that most lepers who come to this country get better, for a time at least, with or without medication, and when treatment is employed it is difficult to differentiate between its effect and that of climate and improved modes of living. Thus in a case of pronounced tubercular leprosy referred to me some two years ago by a colleague in New York, the cutaneous manifestations entirely disappeared within a few months under the influence of large doses of chaulmoogra oil internally, with daily baths and inunctions of gurjun oil. In another patient referred to me five years ago by Dr. Besnier, of Paris, there has been an apparent cure from the use of phosphide of zinc and strychnine. It is difficult to determine what precise measure of curative influence should be ascribed to the drugs in these cases, since in another case, under

observation for two years, there was an arrest of the symptoms under the influence of hot baths, massage, and general hygienic measures—no drugs whatever having been administered.

CONCLUSIONS.—For purposes of conciseness, the writer's views may be summarized in the following conclusions:

1. From the standpoint of scientific therapeusis, a clear conception of the pathogenesis and pathological anatomy of leprosy is an essential condition in formulating the principles of rational treatment.

2. It is now generally conceded that Hansen's bacillus is the active, efficient cause of leprosy, and that the presence of the bacilli in the tissues sets up either directly, or indirectly through their toxines, the vast array of organic changes and functional disorders peculiar to the disease.

3. There is no substance known to science which, introduced into the body, is capable of destroying the bacilli without destroying the living cells which contain them.

4. Furthermore, from the nature of the pathological changes and the position of the bacilli in the deeper tissues, it is evident that no germicidal agent can be brought into direct contact with the pathogenetic organisms, and hence all treatment which has for its object the destruction of the bacilli is impossible of application.

5. The treatment of leprosy by injections of tuberculin has been disappointing in its results. Experiment has shown that the action of tuberculin is positively pernicious in setting free the bacilli in the tissues and determining the development of new foci of the disease.

6. The treatment of leprosy is essentially empirical; whether, as has been claimed, certain remedies act by virtue of their sterilizing properties upon the living tissues, rendering them unsuitable to the growth and multiplication of the bacilli, cannot be determined.

7. The more or less rapid development of leprosy depends upon the resistance of the tissues to the inroads of the bacilli. In exceptional but well-authenticated cases, this capacity of resistance is sufficient to dominate and destroy the pathogenetic microbes, as shown by the observation of abortive cases in which indubitable signs of the disease definitely disappear and never recur.

8. This capacity of resistance may be strengthened by change of climate, improved habits of living, and measures calculated to build up and maintain the general health at the highest standard.

9. Observation shows that the removal of a leper from an infected district to a more favored climate exerts a marked modification upon the course of the disease; there is, for a time at least, an arrest or retrogression of the symptoms. This lull in the manifestations is, as a rule, disappointing in its duration. Of the one hundred and sixty Norwegian lepers who have emigrated to this country, there is no record of a single definite cure.

10. A dry, moderately cool, mountain atmosphere is most favorable in its influence upon the disease. A hot moist climate, or a damp cold climate are both unfavorable.

11. A nutritous diet of fresh meat and vegetables, warm clothing, exercise in the open air, freedom from exposure to damp and cold, are important elements in the hygienic course of treatment.

12. The care of the skin by frequent hot baths, massage, with inunctions of oils, etc., should receive as much attention as the constitutional treatment.

13. The special remedies which clinical experience would indicate to be of the most value, are chaulmoogra oil, gurjun oil, arsenic, and certain agents of the strychnos family; all are, however, more or less disappointing in their results.

14. All observers agree that in advanced cases, where general dissemination of the bacilli has taken place, curative treatment is absolutely futile. The most favorable conditions are that treatment be instituted early, and that it be prosecuted actively and energetically during a prolonged period.

15. The surgical treatment of leprous sores, necrosed bones, perforating ulcers, the excision of tubercles, amputation of the members, tracheotomy, various delicate operations about the eye, nerve-stretching for the relief of pain, the removal of threatening complications, are of the most signal benefit.

16. Finally, we may conclude that while medical science holds out no definite promise of cure to the leper, its resources are sufficient to arrest or retard the progress of his disease, to promote his comfort, and to prolong his life.

A CLINICAL AND EXPERIMENTAL STUDY OF URÆMIA.

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(Continued from p. 193.)

Pathogenesis.—At the outset we are confronted by the possibility that uræmia may be due to purely mechanical causes, a theory brought to its highest perfection by Traube, who holds that it is the result of œdema of the brain and consequent anæmia, brought about by the watery condition of the blood, coupled with the increased arterial tension.

Mahommed has further elaborated this by adding a cause for convulsions in numerous punctiform hemorrhages into the gray substance of the brain.

This theory, while it may serve to explain some of the phenomena, most notably localized palsies, can by no means be made to fit into all the facts. Three insuperable difficulties are met with. The conditions under which uræmia arises are so diverse that by no possibility can the same mechanical condition of the brain obtain in all of them. The accumulating evidence of post-mortem examinations negatives the assumed facts. Experimental observations have failed to bear out the theory, so that we are forced to discard this mechanical theory and take refuge in the other, that uræmia is due to substances circulating in the blood. This brings us face to face with another problem: Are these substances constantly present in the blood or do they arise under exceptional circumstances? First, let us consider under what conditions uræmia arises. These may be briefly summarized as (*a*) conditions in which the kidney is diseased and (*b*) those in which its secretion, from other causes, is diminished. We look then naturally to the constituents of the urine for the uræmia-producing substances. Urea, the most important constituent and the one from which the name is derived, cannot be considered the sole, nor, indeed, even the principal, cause. It is not constantly present in excess in the blood of uræmiacs. Uræmia may arise during the free excretion of urea. Experimentally it fails to produce the typical symptoms. Then urea is one of the most powerful diuretics known, and its effect would be rather to relieve than produce uræmia. Carbonate of ammonia, a derivative of urea, brought forward by Frerichs as the cause of uræmia, has greater objections even than urea. It is only exceptionally present in the blood. The injection of large quantities of urea will not be followed by the appearance of carbonate of ammonia. Its formation in the blood presents insuperable difficulties, unless, as was held by Freitz, the conversion of urea into carbonate of ammonia takes place on the gastro-intestinal mucous membrane, whence it is absorbed. But even this would not outweigh the first two facts urged against it.

Landois sprinkled kreatin and kreatinin on the exposed brain centres and got symptoms of uræmia. But our experiments quoted during the consideration of temperature, with the injection of these substances, were negative, no effect whatever being produced. The effect obtained by the local application was evidently due to mechanical or chemical irritation, and kreatin and kreatinin are not uræmia-producers. Thus, then, none of the better known constituents of urine are the ordinary causes of uræmia; and yet urine is distinctly poisonous, as has been determined by Bouchard in his most elaborate series of experiments. He suggests the existence of seven poisons, diuretic (urea), narcotic,

sialagogue, myotic, temperature-reducing, and two convulsants, one of which is a potash salt. These poisons, he thinks, are largely alkaloidal. In addition, he determined the fact that the toxicity varies widely, being least during sleep. In some of the specific fevers the toxicity is immensely increased, while in Bright's disease it is diminished.

Laulainé and Chamberlent have shown that toward the end of pregnancy the toxicity is diminished. Favelier found that in children the urine is less toxic than in adults. Feltz and Ritter, who were the first systematic investigators of urinary toxicity, thought the toxic substance was the potash salts; but this Bouchard has disproven. Here we see that while urine is toxic, yet there is a multiplicity of toxic substances, and that their nature is not yet determined. These toxines are probably pre-formed in the blood, for, without limiting its powers merely to filtration, yet it is likely that the office of the kidney is to separate excrementitious substances from the blood and not to create. As the toxicity of the urine varies so appreciably in health, it is probable that disease may still further disturb it, increasing it vastly or even adding new toxines. Hence the possibility of the existence of uræmia without kidney lesion, the result of an over-production of toxic substances. Here let us introduce our experiments upon the production of uræmia:

Exp. XXX.—9.30 A.M. Patient who had been in uræmic condition for several days was bled freely, and the blood whipped with all precautions of antisepsis. This blood was then injected into the jugular vein of a dog weighing 32 pounds, as follows:

11.00 P.M. Dog very lively and in perfect health.

11.15. Injected 10 c.c. per jugular vein.

11.16. Injected 10 c.c. per jugular vein. Urination, defecation, and vomiting. Respiration very irregular, at first slowed, and then later quite rapid.

11.20–11.25. P.M. Injected 30 c.c. Seems very sick.

11.30. Vomiting; heart irregular. Dog will not respond to calling, and makes no effort to get up when untied.

11.40–11.50. Injected 60 c.c. per jugular. Vomiting continuous.

11.55–12.00. Injected 100 c.c. Seems very sick.

12.05 A.M. Injected 150 c.c.

12.30. Condition remains the same. Frequent vomiting and purging. Deeply comatose. Died at 11 A.M. next day.

Autopsy showed brain normal. Lungs contain numerous hemorrhagic infarcts. Heart apparently normal, containing currant-jelly clots. Spleen normal. Liver showed a number of areas much lighter in color than the rest of the organ. Kidneys were both greatly enlarged, cortex swollen, whole organ so hemorrhagic that one cannot make out the pyramids. Blood exudes freely from surface of section on slight pressure. Bladder contained about f℥iij of black urine which contained vast numbers of red blood-cells, blood-casts, and granular matter.

As in this case we had introduced whipped blood containing corpuscles, we made the following control experiment to see the effect of introducing whipped blood from a man without uræmia into a dog.

Exp. XXXI.—Dog, weight 27 pounds. (Bled a case of lead-poisoning.)

12 M. Dog lively. Temp. 39.4° C.

12.20 P.M. Injected 10 c.c. whipped blood per jugular.

12.22. Urination.

12.23.
12.30.
12.33.
12.34. } Injected 10 c.c. per jugular.

Dog untied; runs about the laboratory, and seems as lively as before the injection.

12.45. Injected 30 c.c. per jugular. No effect.

12.57–1.00. Injected 50 c.c. Temperature 39.1° C. As bright and playful as before the injection.

1.15. Injected 30 c.c. per jugular.

1.40–1.50. Injected 75 c.c. per jugular. No effect.

2.00. No symptoms. Urine dark in color. Temperature 39.1° C.

EXP. XXXII.—Same dog as in Experiment XXXI. Weight 30 pounds. The case of lead-poisoning which had been bled for the control Exp. XXXI. developed suppression, only passing two ounces of urine in twenty-four hours. At the end of twenty-four hours, before any uræmic symptoms had appeared, he was bled and the blood allowed to clot. The serum was then injected into the same dog.

1.10 P.M. 100 c.c. blood serum injected slowly into the jugular vein.

1.15. Intense retching; breathing slowly; pupils dilated; comatose..

1.22. Injected 50 c.c. serum into vein.

1.25. In deep coma. When untied makes no effort to get up.

1.30. Respiration rapid.

1.32. Injected 25 c.c. per jugular.

1.45. Remains in deep coma; heart weak; reflexes good. Does not respond to prick of pin.

2.00. In same condition.

2.30. Coma not so deep. Responds to prick of pin, but makes no effort to get up. Urine of normal color.

3.00. Condition the same.

3.12. Had a severe convulsion.

3.22. Died.

Autopsy: Lungs show three or four small hemorrhagic infarcts; liver and spleen normal; kidneys of normal size, slightly congested, especially the pyramids. Bladder contained about f℥j of straw-colored urine which showed nothing on microscopic examination. There was considerable venous congestion of the membranes of the brain, otherwise brain normal.

EXP. XXXIII.—Black dog, weight 13 pounds.

1 P.M. Injected subcutaneously 60 c.c. of blood serum from a case of profound uræmic coma terminating fatally.

1.10. Retching, and vomiting of the contents of the stomach.

1.30. Very dull, seems quite sick.

2.00. Persistent retching; copious vomiting of serous matter.

Placed 60 c.c. of blood serum in a dialyzer with 60 c.c. distilled water. Next day, 1 P. M., injected subcutaneously 60 c.c. of water of dialyzer into same dog. Observed for several hours; no effect. Next day (seventy-two hours after the bleeding) injected the 50 c.c. of blood serum of dialyzer into the same dog without any effect.

EXP. XXXIV.—An old drunkard with long-standing nephritis, cirrhotic liver, and atheromatous arteries was admitted to the hospital with delirium tremens. Urine contained much albumin and hyaline and granular casts. Was passing eight ounces of urine in twenty-four hours, and soon developed uræmic symptoms. Had marked ascites. Was tapped and rapidly improved.

Dog, weight 31 pounds.

2.30 P.M. Temperature 38.8° C.

2.45–2.50. Injected per jugular vein 50 c.c. ascitic fluid.

3.00. No effect.

3.05–3.20. Injected 100 c.c. No effect.

3.50. Injected 200 c.c. Free salivation; retching; very sleepy.

4.00. Retching and vomiting continue.
4.20. Injected 50 c.c. Temperature 39.6° C.
4.30. Injected 75 c.c.
4.50. Very drowsy. Temperature 40.5° C. Urinated very freely. Some vomiting and severe purging continued all the next day.

EXP. XXXV.—Dog, weighing 32 pounds.
2.12 P.M. Temperature 38.3° C.
2.20–2.25. Injected per jugular 50 c.c. ascitic fluid as in Exp. XXXIV.
2.55. Injected 100 c.c. No effect.
3.15. Injected 100 c.c. Seems dull.
3.40–3.45. Injected 100 c.c.
4.00. Vomiting—serous and food ingested. Seems quite ill. Temp. 39.9° C.
4.20. Injected 50 c.c.
4.45. Much sicker. Severe purging. Temp. 39.5° C. Purging and vomiting continued all night and all next day.

EXP. XXXVI.—One week after tapping patient in Exp. XXXIV., the uræmic symptoms had entirely disappeared, but he had ascites again. Was tapped again.
Same dog as in Exp. XXXIV.
3 P.M. Injected 200 c.c. ascitic fluid.
3.15. No effect.
3.20–3.40. Injected 200 c.c.
3.50. Injected 150 c.c. Dog observed for two hours. Does not seem to be affected in any way. No symptoms next day.

EXP. XXXVII.—Same dog as in Exp. XXXV.
2.45 P.M. Injected per jugular 100 c.c. same ascitic fluid as in Exp. XXXVI.
3.00. No effect.
3.15. Injected 100 c.c.
3.45. Injected 150 c.c. No effect at all.

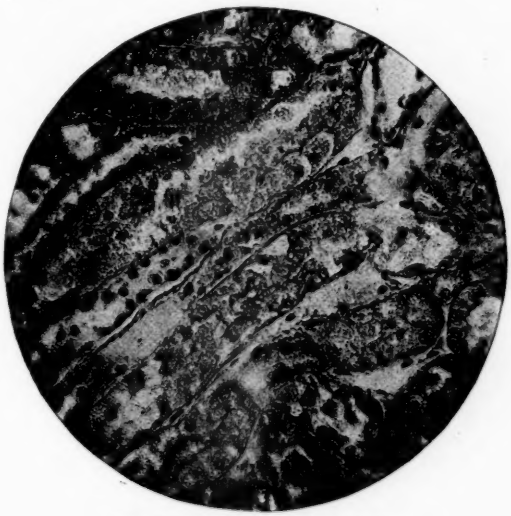
EXP. XXXVIII.—Young dog, weighing 26 pounds. Ligated both renal arteries with all precaution of antisepsis that can be carried out in the laboratory. The operation is not a very severe one, and the animals do not suffer from shock. In some of the experiments both artery and vein were ligated, but usually, as in this experiment, only the renal arteries were ligated. In twenty-four hours the dog seemed very sick, but still walked about. He vomited and purged rather freely. At the end of forty-eight hours it was noticed that he would avoid large objects, but would run against small ones in walking—in other words, he had a central blindness and peripheral vision. His eye-grounds were examined by Dr. James Wallace, who found areas of fatty degeneration in the retina, such as are seen in advanced Bright's disease. There were no hemorrhages and no retinitis.
This dog was then bled to death, and blood allowed to clot. 75 c.c. of the blood serum injected into a dog, weighing 13 pounds, made him quite dull, and he appeared sick (dog had been very lively before).
75 c.c. of the serum, undiluted, was placed in a dialyzer with 75 c.c. of distilled water. The dialyzer was kept in a cool place for twenty-four hours. At the end of this time, 75 c.c. of the distilled water was injected into the same dog, weighing 13 pounds, producing absolutely no symptoms. But the 75 c.c. of blood serum from the dialyzer, injected into the vein of a dog weighing 26 pounds, produced in fifteen minutes severe retching which lasted several hours, and was attended with considerable vomiting.

EXP. XXXIX.—Dog, weighing 24 pounds. Ligated both renal arteries. At end of twenty-four hours dog showed great thirst. Drinks water and vomits it immediately. Has been vomiting and purging some little, but is not yet very ill. At the end of forty-eight hours was found in a violent convulsion. Had three convulsions in a half-hour. Was bled to death, but by an accident the blood serum was lost.

FIG. 1.

Convoluted tubules of kidney of dog injected with blood serum of another dog made uræmic by ligation of renal arteries.

FIG. 2.



Collecting tubules of the same kidney.

This was the only case in which we have observed convulsions in the uræmia resulting from ligation of the renal arteries. In several cases we have produced convulsions by the sudden introduction of uræmic serum. The ligation of the renal arteries produces in dogs a condition of uræmia apparently the same as that occurring in man. The symptoms appear in a striking way by the end of twenty-four hours, and death results in from thirty to seventy-two hours. We have produced uræmia in this way in thirteen dogs, some dying before we had the opportunity of bleeding them to death. In the only case in which uræmia did not immediately follow the ligation, there was found an anomaly of two renal arteries to one kidney, and only one had been ligated. The most constant symptoms in these animals are those of the gastro-intestinal tract and the stuporous condition. The blood serum of these animals produces uræmia in other previously healthy animals, just as is produced by the blood serum of men in the condition of uræmia. The following experiments show this.

Exp. XL.—Bled a dog to death ten hours after the ligation of the renal arteries. Blood allowed to clot in the ice-chest. (Of course, in all these experiments the bleeding was done with great care by means of a sterilized glass canula, the blood received in a sterilized flask, and then kept in the ice-chest.)

5.20 P.M. Injected per jugular vein 50 c.c. of this serum into a dog weighing 16.5 pounds.
5.30. Injected 50 c.c.
5.40. Profuse salivation; seems sick; will not stand up when untied.
6.00. Salivation and stuporous condition continue.

In the next four experiments the blood was obtained from three large dogs, twenty-four hours after the ligation of their renal arteries. As they all had the same symptoms (vomiting, purging, and stupor) their blood was mixed and allowed to coagulate.

Exp. XLI.—Dog weighing 28 pounds.
4.45 P.M. Pulse and respiration both slow.
4.50. Injected per jugular 200 c.c. blood serum mentioned above.
4.55. Respiration and pulse remain the same.
4.56. Injected 100 c.c. Muscular tremors; respiration continues slow; pulse very rapid and weak.
5.10. Vomiting.
5.15. Purging; seems very sick. Retching and purging continued several hours.

Exp. XLII.—Dog, weight 26 pounds.
5.15 P.M. Injected 100 c.c. same serum as that used in Exp. XLI. heated to 58° C. for five minutes. No effect from injection.
5.18–5.23. Injected gradually 100 c.c.
5.25. Injected 100 c.c. No effect. When untied runs about room and seems as lively as before the injection.

Exp. XLIII.—Dog, weight 24 pounds.
3.40 P.M. Injected per jugular vein 200 c.c. of serum, obtained as mentioned above, which had been in a dialyzer for thirty-six hours in a cool place, and had been diluted with distilled water before being placed in the dialyzer.
4.00. No effect, except some muscular tremor.
4.10. Some purgation.

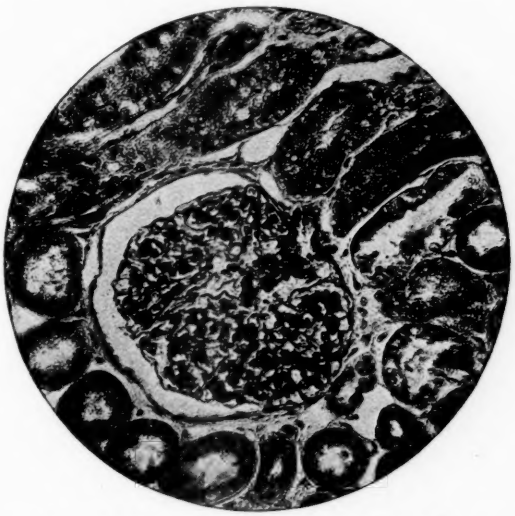
Exp. XLIV.—Dog, weight 22 pounds.
4.25 P.M. Injected slowly per jugular vein the distilled water of the dialyzer, 150 c.c. There were no symptoms at any time.

Exp. XLV.—Dog, weight 20 pounds. Large dog, was bled to death twenty-four hours after the ligation of renal arteries.

4.00. P.M. Injected per jugular 75 c.c. of this serum heated to 50° C.
4.30. Free salivation.
4.40. Purging and vomiting.
These gastro-intestinal symptoms continued for some hours. Dog recovered.

EXP. XLVI.—Dog, weight 23 pounds.
2.33 P.M. Injected per jugular vein 25 c.c. urine of case of subacute Bright's disease. Pulse slowed.
2.34. Injected 50 c.c.
2.35. Injected 100 c.c.
2.36. Injected 50 c.c.
2.38. Injected 100 c.c.
Pulse much slower and pressure lowered after each injection, but it immediately returned to the normal.
2.41. } Injected 50 c.c.
2.42. }
2.43. }
2.45. Injected 75 c.c.
2.57. } Injected 50 c.c.
3.00. }
3.05. }
The respiration became slower and the pulse more frequent in the latter part of the experiment. Notwithstanding the enormous quantity injected the blood-pressure always recovered itself. While the dog did not seem as bright as usual when untied, the only prominent symptom was a profuse diuresis. The dulness lasted several hours and then entirely disappeared.

FIG. 3.



Kidney of dog injected with blood serum of woman having Bright's disease, but without uræmia (Exp. XLVII.). Hardened in Fleming's solution. Showing marked fatty degeneration.

EXP. XLVII.—Bled a woman with chronic parenchymatous nephritis, who had never had any other symptom of uræmia than headache.

Injected 250 c.c. of the blood serum into jugular vein of a dog weighing 25 pounds. There were no symptoms resulting from the injection.

FIG. 4.

Collecting tubules of same kidney; also showing fatty degeneration.

EXP. XLVIII.—Dog, weight 15 pounds. Injected subcutaneously 50 c.c. blood serum from a case of uræmia, comatose in type. These injections were repeated on each of the three days following. At the seat of each of these injections there was developed an abscess, although the ordinary antiseptic precautions had been taken.

On the fifth day injected per jugular vein 100 c.c. of the serum. The dog became very ill, but did not die. He had showed no positive symptoms until this last injection.

A review of the results of these experiments shows that ligation of the renal arteries in dogs is followed by a progressive fall in blood-pressure and by the constant development of a set of symptoms preceding death, identical in all instances. Serum obtained from the blood of such dogs, or the blood itself injected into other dogs, will produce in these latter a series of exactly similar symptoms, terminating in death if the amount of injecting fluid be large enough. Not only this, but if blood drawn from uræmic human beings be injected, a similar set of phenomena will follow. Or if ascitic fluid obtained during an attack of uræmia be used, the same result will be brought about. If, however, ascitic fluid which has reaccumulated after the uræmia has subsided be used, no such result can be obtained. Whether the fluid is injected subcutaneously or intra-venously makes no difference whatever in the

FIG. 5.

Convoluted tubule of kidney of dog injected with blood serum of man with uræmia.

FIG. 6.

Collecting tubules of same kidney.

state of affairs resulting; the symptoms are exactly similar; possibly they follow somewhat more promptly on an intra-venous injection, but they nowise differ in character or intensity. These symptoms, without going into them in wearisome detail, are those which are referable to the brain and to a condition of the brain which is evidently brought about by the action upon it of some poisonous substance—dulness, coma, loss of muscular power, muscular twitchings or even general convulsions, and disturbances of the gastro-intestinal tract. They are so definite, so uniform, so closely analogous with the symptoms of human uræmia, that it cannot be doubted that we have to deal in them with an artificially produced uræmia. Some of the symptoms developed are worthy of special attention. They are those connected with the gastro-intestinal tract, which in this experimental uræmia are much more uniformly prominent than in human uræmia. Evidently the vomiting and purging, from the character of their onset and their close association with other nervous symptoms, are not altogether an attempt at vicarious elimination, but partly at least centric. Salivation is prominent, differing here from human uræmia, where it is rare.

What is the nature of this uræmia-producing poison? That we have been dealing with one poison, present equally in uræmic human blood, dropsical effusions in uræmia, and in dog's blood in experimental uræmia, is made evident by the perfect similarity of its action. That this poison cannot be one of the ordinarily recognized constituents of the urine, as has been hitherto believed, nor even the sum-total of all these urinary constituents, is proven by the fact which we have demonstrated, that the injection of these constituents or even of urine itself will not produce uræmia; while such injections, if the amount used be inordinately large, will produce certain symptoms, yet these symptoms are not comparable in degree or kind with those produced by the injection of uræmic serum, and they do not constitute the condition which we recognize in man as uræmia. Thus, then, we have in uræmia to deal not with an intoxication due to a retention of urine or its constituents in the blood, but with a poisoning by a substance whose nature, or even, indeed, whose existence, has not yet been recognized. A clinical proof of this same fact is the possibility of the existence of uræmia while in the kidneys there is no demonstrable evidence of disease and normal amounts of normal urine are being secreted. While, however, the retention in the blood of substances ordinarily recognized as being excreted in the urine is not the cause of uræmia, yet after uræmia has been produced, such retention may in all probability have a certain effect, aggravating the already existing condition or determining its variety. The poison, then, must be a special one circulating in the blood under conditions which are not governed wholly by the action of the kidneys as it is evidenced in the urine. As to its exact nature, our

experiments have not progressed to the point where we can speak with entire confidence, but further work will undoubtedly clear this up. The facts that we have ascertained positively are that its uræmia-producing power is rendered abortive, or at least much lessened, by the moderate application of heat, and that it is not readily dialyzable. From the foregoing considerations there is at least probability in the assumption that it is some unknown low-grade product of metabolism or any one of a series of such products. From the effect produced upon it by heat and dialysis this seems to be an albuminous body. Clinical facts would seem to indicate that this poison is not constantly circulating in the blood, but that it is only exceptionally present, and that uræmia is induced by its slow and gradual accumulation in the blood, owing to an inability of the kidneys to excrete it, or more rarely to a sudden and enormous production.

Vastly more important even than the bearing of these experiments upon uræmia is their relation to Bright's disease. In the kidneys of dogs injected with uræmic blood serum, or dropsical effusion, there was found a uniform and constant condition. The cells of the tubules, both straight and convoluted, were swollen and granular, the cell walls lost, the nuclei indistinct or breaking down. In places the process had gone so far that the tubules, instead of being lined with a distinct layer of epithelium, were filled with a granular mass in which neither cells nor nuclei could be distinguished, presenting exactly the appearance of a tube-cast *in situ* in common examples of acute nephritis. This granular mass did not take the stain, and the granules failed to clear up on the application of acetic acid, nor did ether dissolve them. As a rule the granules did not take the osmic stain, but occasionally when the lesion was more advanced, owing to the larger amounts of poison employed, they were stained black, showing their fatty nature. Occasionally, too, the endothelium of the Malpighian bodies was proliferating and the tufts beginning to degenerate. Altogether, some of the cases suggested strongly a glomerulo-nephritis as we see it in man. All stages of the lesion could be traced from a beginning granular condition to a decided fatty degeneration; the effect produced upon the kidneys was the same in all instances, the lesions differing only in degree.

In injecting blood serum and urine from cases of Bright's disease where uræmia had not been a symptom, there was no uræmia produced, but there was found after killing the dogs the same lesions of the kidneys as had followed the injection of uræmic fluids. As a rule the lesions were not so marked as in uræmia.

As to the nature of this nephritis-producing substance. From its constant association in large amounts with uræmia it is probably the same as that producing this latter condition. When we obtained the kidney degeneration by injecting serum or urine from Bright's disease,

the amounts of injecting fluid used were much larger than in uræmia, so that although the uræmic poison must exist in small proportions here, yet by using larger amounts of the fluid enough of the substance might easily be obtained to affect the kidneys. While moderate heating abated so much of its toxicity as to prevent uræmia, yet it did not prevent nephritis, but the nephritis was not so marked as where heat was not employed. In the dialyzer, when the serum was freely diluted with distilled water, enough of the toxic substance came over to produce nephritis and not uræmia, but, as in heating, the nephritis was here not so marked as before dialyzation.

The demonstration of the existence of this poison, while it explains the origin of at least some of the forms of Bright's disease, explains also many things hitherto obscure as to the connection between uræmia and Bright's disease. If the same poison produces uræmia and nephritis, uræmia would be frequent in acute nephritis—which is a clinical fact—because it must require the presence of large amounts of the poison to produce such marked inflammatory condition of the kidneys, and a nervous system unaccustomed to the presence of the poison must of necessity be profoundly influenced. There being a sudden and probably temporary generation of these large quantities of the poison, it can be easily seen why such uræmia is so frequently recovered from, the poison being soon eliminated, and why such nephritis may completely disappear. Uræmia occurs most frequently during the course of chronic nephritis, not so much on account of a failure of the kidneys to perform their function as because of an unusual generation of the poison, though here probably, when the kidney secretion is blocked, the retention of the constituents of the urine aids in the production of uræmia. Here, too, from the conditions attending the presence of the poison, recovery is frequent. When, on the other hand, uræmia originates slowly at the end of a long-continued nephritis by a slow accumulation of poison, the termination is almost necessarily fatal.

Experiment XLVIII. was very interesting. Here the most marked kidney lesions were obtained, as well as fatty degeneration of the liver. This was the only case in which injection of serum produced abscesses, and this result was evidently connected in some way with an exceptional virulence of the poison, for in bleeding the uræmiac who furnished the serum some of the blood splashing upon the wrist of the operator and the hand of a nurse produced an erythema.

Last, in Experiment XXXVIII., along with the development of the uræmia came the characteristic fatty degeneration of the retina found in Bright's disease. So that albuminuric retinitis, instead of being the result of changes in the retinal vessels, is really due to the direct action of the poison producing uræmia and Bright's disease.

CONCLUSIONS.—1. Uræmia is an intoxication by a poison circulating in the blood.

2. This poison is present in serous effusions as well as in the blood.

3. It is probable that in addition to the pathogenic poison of uræmia there are, under certain conditions, other secondary ones active in its production.

4. The poison producing uræmia will also produce nephritis and a fatty degeneration of the retina, the cause of the eye symptoms in Bright's disease.

5. This poison is probably some albuminous substance. It is affected by heat and is only with difficulty dialyzable.

6. It is probable, but not certain, that this poison is not constantly circulating in the blood, but that under exceptional conditions it becomes developed.

7. It is possible to have uræmia without any previously existing lesion in the kidneys.

TREATMENT.—As uræmia is a poisoned condition of the blood, our efforts should be directed mainly toward the elimination of the poisons. But as their nature is not yet clearly understood, our treatment is still largely empirical, guided and controlled by what little theoretical knowledge we possess.

Convulsions, in addition to the general treatment of uræmia, will sometimes need a treatment of their own. As a rule a convulsion will end spontaneously, but occasionally it will be unduly prolonged, or one may follow another in rapid succession. Here the inhalation of chloroform, ether, or amyl nitrite will be advisable. Of these amyl nitrite is most easily given and is quickest in its action, but it possesses the disadvantage of being less reliable. Morphine in full doses may be used with advantage. While until within a short time its use in Bright's disease has been regarded as extremely dangerous, yet now it is clearly recognized that it is attended with comparatively little risk. Its effect must, however, be carefully watched, for we have unquestionably seen bad results from it. Especially where uræmia complicates fevers must the greatest care be used, for these are the cases in which it is most likely to do harm.

In considering the treatment for general uræmic symptoms, we have to guide us some useful hints derived from the symptoms. First, in those cases in which diarrhœa exists, the nervous symptoms are least likely to be pronounced. Second, the perspiration of uræmiacs frequently contains large quantities of urea.

Following out the first suggestion, then, the bowels are to be kept freely open, or even hypercatharsis produced. Vegetable purgatives have yielded us better results than mineral, besides being easier of administra-

tion. If calomel be used, it must be remembered that mercurial salivation is sometimes easily produced in Bright's disease.

Perspiration being the other channel for the elimination of urea, and possibly other excrementitious substances, it must be aided by every means at our command. These are the use of pilocarpine internally and the stimulation of the skin by local measures. Pilocarpine must be exhibited with great care, for its use is not unattended with danger. But recently we have seen a case where pulmonary œdema followed its use, and where a fatal termination was averted only by the most energetic measures. So that free sweating is most safely brought about by external heat, applied either by a hot-air bath or a hot pack. Of the two the hot pack has seemed to us rather preferable, producing less discomfort and exhaustion and being surer in its effect. A number of times we have noted cases in which free perspiration was brought about by a hot pack after a hot-air bath had failed. Outside of hospital practice the hot pack is certainly the more easy of application. Pilocarpine, in small doses, is often a most valuable adjuvant to either the hot-air bath or hot pack.

If there be pyrexia, heat should be most carefully applied, and the temperature constantly watched. If there be any rise such an attempt to produce perspiration must be abandoned. We have seen a case of moderate pyrexia where, owing to a misunderstanding, the patient was left in a hot-air bath for two hours. At the end of that time no perspiration had been induced, but the temperature had risen considerably. After removal from the bath the temperature continued to rise in spite of all efforts to the contrary, and death ensued when it reached 107.9° F.

As the poison is contained in serous effusions as well as in the blood, and as resorption of these effusions may throw enough of the poison into the blood to cause uræmia, it is necessary to withdraw effusions whenever met with, as early as possible. No condition of the patient will contraindicate tapping. It must be remembered that the symptoms of uræmia are manifold, and that not too much attention must be paid to them from any other point of view than that of uræmia.

Free venesection will abstract directly some of the poison, and, as a treatment, cannot be too highly recommended. Applicable to any form of uræmia, its good effect is most forcibly manifested in the grave cases. The existence of marked dyspnœa is its most urgent indication, and next the presence of prominent cerebral symptoms. It seems, from our experience, that it may abort a threatened attack of uræmia. A pronouncedly weak pulse will in no wise forbid its employment, for we have repeatedly seen the pulse strengthen while the blood was flowing. The quantity to be drawn will depend upon the exigencies of the case and the effect produced, being, as a rule, not less than a pint, or even a quart or more.

Bloodletting may be beneficially supplemented by transfusion of a normal saline solution. Especially is this valuable where the loss of blood threatens to weaken the heart too much. The saline solution is also diuretic, and may possibly be a direct antidote to the poison. The transfusion may be done intra-venously in exceptional cases when time is of importance; but this may entail some danger unless most carefully performed. Practised subcutaneously, it will be found that absorption is marvellously rapid. We wish to urge strongly this transfusion, for in our hands it has proven of the greatest good. In a case of pulmonary œdema, where its use would be theoretically contra-indicated, it was followed by a most prompt relief of the symptoms, which bloodletting alone failed to abate.

Diuretics are practically of no value. While the cessation of uræmia is attended by a re-establishment of renal secretion, this is a consequence rather than a cause of the cessation, and possibly the attempt to produce artificial diuresis may entail the danger of an additional irritation of an already overloaded kidney.

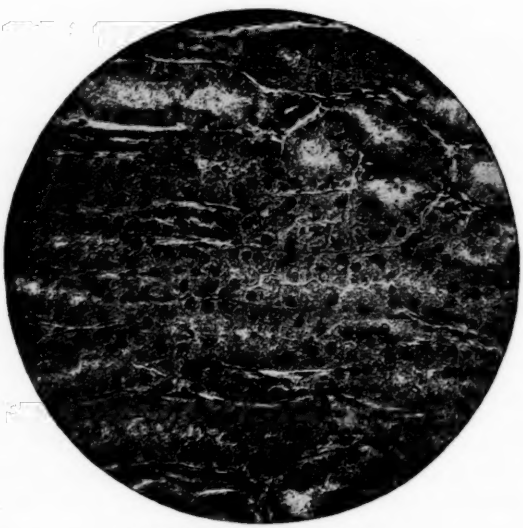
ADDENDUM.—Since writing the above, which constitutes the Boylston Prize Essay, other experiments have been undertaken which have a direct bearing upon the production of nephritis, and it is thought advisable to insert them here as still further elucidating the subject. In these, serum obtained from the blood of a young man, healthy so far as the kidneys were concerned, was used. The man, aged twenty-two years, was in the Presbyterian Hospital with lumbago. He had had no illness which could have produced a consequent lesion of the kidneys; his urine throughout his stay in the hospital was uniformly normal; nor was there anything in his symptoms or condition which would lead to a suspicion of nephritis. He was bled after his complete recovery from the lumbago. This serum, when injected into dogs, produced no symptoms whatever; but upon killing the dogs lesions of the kidneys were found analogous with those in kidneys where injection of serum from nephritis was practised. The lesions, however, noticed so uniformly throughout the latter, were, where healthy serum was used, not so evenly distributed; in places the kidneys were practically normal, in others slightly degenerated. Nor was the degeneration nearly so pronounced as after the injection of diseased serum; the process seemed to be the same, but it was not so far advanced and there was nowhere any fatty degeneration; in fact, it suggested a smaller amount of poison or one of less virulence. Figs. 7 and 8 show a section through a portion of the kidney most markedly affected.

The poison here must be the same as that in the blood of nephritis, for the reason that the lesions obtained in the kidneys are identical. Having established this fact, it is evident that one of two suppositions must be correct—either this man had nephritis or there is constantly

FIG. 7.

Convoluted tubules of kidney of dog injected with blood serum of healthy young man, showing granular appearance of cells.

FIG. 8.



Collecting tubule of same kidney.

present in normal blood a substance which, in sufficient quantities, is capable of producing nephritis. It is scarcely possible that the man's kidneys could have been diseased; great care was taken to exclude this by careful examinations of his urine and by a thorough canvass of his condition and previous diseases; so we are forced to adopt the second supposition, that the nephritis-producing substance is constantly present.

This same serum injected into rabbits produced in their kidneys a degeneration of the same character as that just described in dogs, but very decidedly more violent; the process was quite uniformly distributed and had advanced much farther. The serum of healthy dogs injected into a rabbit produced again the same degeneration, but here less violent than where human serum was used. On the other hand, serum from horses produced no effect upon the kidneys of rabbits.

We have, then, as the result of these experiments the following facts:

1. Healthy human serum will produce in the kidneys of dogs a moderate degeneration and in those of rabbits a degeneration much more violent.

2. Dog's serum will produce in rabbits a degeneration of a moderate degree of intensity.

3. Horse's serum has no effect upon the kidneys of rabbits.

From these facts it is evident that the order in which serums stand as to their toxicity, and so the amounts of toxic substance which they contain, is: human, dog, horse.

This would suggest still further that the origin of this substance is probably to be traced to the character of the food, and that its production takes place somewhere in the digestive system. For the largest amount of poison is found in man, with his meat-ingestion and complex, easily disarranged digestion; next in dogs, with their semi-carnivorous diet; and least in the horse, a pure herbivore. Clinically, it has been well established that cases of Bright's disease improve when meats and kindred substances have been removed from the food, and do best of all upon that simplest of diets, milk. Experimentally it has been shown that the urine of animals is rendered least toxic by a milk diet. These facts would all point in one direction—they refer us to the digestive tract for the origin of the poison.

ON THE PATHOLOGY OF ARTERIO-SCLEROSIS.

By F. Parkes Weber, M.A., M.D., M.R.C.P. (Lond.).

Arterio-sclerosis was first described by Sir William Gull and Dr. Sutton in 1872. In their paper before the Medical and Chirurgical Society of London,[1] they suggested the name of arterio-capillary fibrosis for the morbid change they described.

The term arterio-sclerosis is merely a Greek rendering of Gull and Sutton's term, but has perhaps the advantage of a more international character.

The essential change, according to Gull and Sutton, was a thickening of the walls of the arterioles and capillaries, more or less in all parts of the body, and more recent observations have not made much advance on this. The hyaline appearance of the fibroid change, as described by Gull and Sutton, was shown to be due to the acidulated glycerin in which their microscopical specimens[2] were prepared. It is also true that in the arterioles Gull and Sutton considered the change to be situated chiefly in the tunica externa, whereas most recent observers have considered the primary change to be rather an accumulation of cells in the interna.

This latter view appears to me not proven and the difference not a matter of the greatest importance. Upholders of the latter view have maintained that the essential change in arterio-sclerosis may be termed an endarteritis obliterans affecting the smaller arterioles. To this term I should prefer the original one of Carl Friedländer, namely, arteritis, or arteritis obliterans.[3] It may certainly not always be easy to see whether a process (even when certainly inflammatory) is primary in the tunica externa or interna, for, as Friedländer points out, cell accumulation in the one is often accompanied by a corresponding process in the other. A double process like this may be the method by which vessels are sometimes obliterated in a tuberculous lung-area, the perivascular irritation giving rise to a sort of endarteritis obliterans; so also at the base of the brain, perhaps a perivascular[4] syphilitic process may sometimes be the cause of an endarteritis obliterans. At any rate, as regards

[1] Transactions of Medico-Chirurgical Society, vol. lv., 1872, p. 273 et seq. Dr. Walshe had in 1849 endeavored to show that "Bright's disease" was of constitutional origin (see Lancet, 1849, vol. ii , p. 29: "Bright's Disease Not Essentially a Renal Disease, but Essentially and Primarily a Blood Disease.") He went, however, in a direction quite different to "arterio-sclerosis," and concluded that "Bright's disease" is a blood disease, *ab initio*, essentially tending to chronicity, though (like cancer and phthisis) sometimes running an acute course.

[2] Fagge's Principles and Practice of Medicine, third edition, vol. ii., p. 464.

[3] Dr. Carl Friedländer, "Ueber Arteritis Obliterans," in the Centralbl. für med. Wissenschaft, January 22, 1876. In this paper of Friedländer the process is discussed with no special reference to Bright's disease.

[4] But either of these processes may also give rise to miliary aneurisms.

arterio-sclerosis, it may still be considered doubtful whether the process begins in the tunica externa or interna, and therefore, as far as arterio-sclerosis is concerned, the term arteritis obliterans seems better than endarteritis obliterans.

There is, however, another objection to either of the terms endarteritis or arteritis obliterans being spoken of as the primary lesion of arterio-sclerosis; this is that the termination "itis" implies that the process is necessarily one of inflammation. For although undoubtedly the two are very frequently associated, it remains doubtful whether inflammation is a *necessary* factor in arterio-sclerosis. As regards this point I have been obliged to look for a modern definition of inflammation. The "rubor, tumor, calor, et dolor" of Celsus can no longer be considered satisfactory except from a purely clinical point of view, in which case it is certainly convenient. The "functio læsa" may be a more constant accompaniment of inflammation, but does not help us in the present case. For the present purpose it is perhaps sufficient to regard inflammation[1] as the series of tissue changes caused by an injury or by the presence of some harmful irritant, and usually leading to an accumulation of cells in the part affected.

This includes the cell accumulation resulting from proliferation of the fixed cells as well as that resulting from the migration of leucocytes. Such a modification of modern definitions of inflammation includes tuberculous affections, and will include cancer and sarcoma if ultimately the presence of coccidia should be proved to be necessary to their development. The presence of necrobiosis, secondary to inflammation or due to the same original cause, will not confound the definition. If then we accept such a definition, does arterio-sclerosis fall under the head of inflammation?

The cell accumulation is certainly present, but the irritant cause is what I consider not proven. It is better to speak of the essential change which the microscope discloses in arterio-sclerosis as a thickening of the external and internal coats of the arterioles, and not to apply to it any particular name implying the presence of inflammation.

This naturally brings one to the *etiology* of arterio-sclerosis. Gull and Sutton left this a doubtful point, and a doubtful point it remains in common with the etiology of many other chronic diseases. All that can be supported by fact is that arterio-sclerosis has some relation to age, syphilis, arthritism, and the uric acid diathesis (if the latter be not included under arthritism); probably only through the diathesis is there any relation with actual uricæmia; furthermore, it must be allowed that an hereditary tendency to arterio-sclerosis, allied to inherited arthritism, may exist.

[1] Compare the definition used by Prof. Burdon-Sanderson in the "Lumleian Lectures on Inflammation," 1882.

How uncertain are the alleged causes of arterio-sclerosis may be gathered from the fact that of two well-known French writers, Huchard[1] includes alcohol, tobacco, saturnism, inheritance, acute and chronic diseases, such as typhoid, smallpox, syphilis, malaria, etc.; whereas Lancereau maintains that arterio-sclerosis always owes its origin to nervous causes. It will be here impossible to do more than allude briefly to the most important of the alleged causes, but in examining them one is struck by the uncertain nature of their claims. Sir George Johnson[2] considered that the kidney disease is primary, that in consequence of this the blood contains urinary excreta, and is otherwise altered, that the minute arteries throughout the body resist the passage of this abnormal blood, and in consequence of this the muscular walls of the arteries and left ventricle become hypertrophied, as seen at autopsies. Johnson's theory was combated by Gull and Sutton; they pointed out that the vascular changes could precede the kidney disease, or, as Bamberger has stated, appear in its earlier stages; moreover, they stated that extreme degeneration of the kidneys (either large white or contracted[3]) may be accompanied by œdema and uræmic symptoms, which indicate doubtless a noxious state of the blood, and yet the characteristic cardio-vascular changes may be absent. Neither does it appear proved that the high-pressure pulse of arterio-sclerosis is due usually to an abnormal contraction of the arterioles, though doubtless this may occasionally occur. If it were so, one would expect to find the muscular coat of the arterioles hypertrophied, as Sir George Johnson described them to be; but, according to most observers, when this thickening exists it is due to increase of fibrous tissue. Certainly in some cases of chronic Bright's disease the arterial tension can be lowered by nitrite of amyl,[4] but this does not affect the point, because arterio-sclerosis, although a generalized disease, by no means affects all parts of the body equally. The mechanical arterio-capillary fibrosis may be the cause of increased arterial pressure, and yet the arterioles over large areas of the body may still be insufficiently affected to prevent them from dilating under nitrite of amyl, and thereby a fall in the general arterial pressure would ensue on the administration of nitrite of amyl.

Let us now consider some other alleged causes of arterio-sclerosis—

[1] Maladies du Cœur," 2d ed., Paris, 1893, pp. 119 et seq.

[2] See Brit. Med. Journal, April 16, 1870.

[3] Med.-Chir. Trans., vol. lv. p. 294. So also it has been stated that chronic interstitial nephritis can be caused through obstruction to the ureters by uterine cancer, without any hypertrophy of the heart resulting. On the other hand, it is stated that high arterial pressure and hypertrophy of the heart may follow hydro-nephrosis, say from impacted calculus, in a few weeks. (See Brit. Med. Journal, November 4, 1893, p. 998.) Gull and Sutton referred to cases of contracted kidneys in young subjects, not over twenty years of age, and believed that such cases were of quite a different nature to ordinary cases of contracted kidney.

[4] *Vide* Fagge, op. cit., 3d ed., vol. ii. p. 467.

namely, acute and chronic infectious diseases. Of these I will confine myself to syphilis, as it is the most often adduced.

Certainly many patients with marked arterio-sclerosis and chronic interstitial nephritis have had syphilis, but the question is whether the proportion in arterio-sclerosis exceeds that in other diseases; moreover, how many patients have had syphilis and even tertiary manifestations, and yet do not suffer especially from arterio-sclerosis! It seems curious that syphilis, which has such characteristic tertiary lesions of its own, should also have been represented as playing so great a rôle in the etiology of many chronic diseases, which certainly are not exclusively[1] dependent on it. I need only mention "arterio-sclerosis," "tabes dorsalis," and "general paralysis of the insane." With reference to the frequent antecedence of syphilis in these diseases, one must remember, first, the great frequency of syphilis as a disease, and, secondly, the cases are to be considered where true syphilis may simulate one of these diseases. Thus, a spurious general paralysis has been described, which is due to actual syphilis, and is really benefited by antisyphilitic treatment; Charcot points out that true syphilis may simulate the symptoms of tabes dorsalis; in like manner true syphilitic lesions may cause (by occlusion of vessels or rupture of miliary aneurisms of syphilitic origin) brain symptoms which are frequent in arterio-sclerosis.

In short, the claims of syphilis do not appear quite established as regards the etiology of arterio-sclerosis.

There certainly are some remarkable cases which appear to support the view that syphilis may give rise to arterio-sclerosis. Such a case is that narrated by A. Fraenkel at the Berlin Medical Society (*Berliner klin. Wochenschrift*, 1894, No. 12).

The patient was a woman, aged thirty-six, who died in an attack of angina pectoris. At the necropsy on this case the right coronary artery was found to be obliterated at its orifice by a process resembling arterio-sclerosis, and to confirm the view that this apparent arterio-sclerosis was really due to syphilis, a gumma was found in the septum ventriculorum. Might not, however, in this case and in similar cases, the stenosis of the artery be due to an actual tertiary syphilitic process, and, though closely resembling a process of precocious arterio-sclerosis, be really caused by the irritation of the specific poison or microbe of syphilis, if such a specific microbe or poison be admitted as the cause of tertiary syphilitic lesions? If, then, the claim of syphilis still appears doubtful, the claim of other infectious diseases to be regarded as causes of arterio-sclerosis appears more doubtful.

Other alleged causes are the continued presence of abnormal sub-

[1] Unless, in the case of tabes, we accept the view of those who make syphilis a *necessary* antecedent of tabes dorsalis.

stances in the blood or tissues, due to indulgence in alcoholic drinks, tobacco-smoking, saturnism, or uricæmia. Statistics have not yet settled these questions.

If we suppose that these substances cause arterio-sclerosis by inducing spasm of the arterioles we admit that the high arterial pressure is the cause and not the effect of arterio-sclerosis; but, as I have just pointed out, the increased arterial pressure may be the effect and not the cause. If, on the other hand, we suppose that these substances act by setting up a chronic inflammation in the walls of the arterioles, we admit that the essential lesion in arterio-sclerosis is one of chronic inflammation, and I pointed out (when speaking of endarteritis obliterans) that this assumption is not justified. That chronic lead-poisoning may induce a chronic interstitial nephritis is admitted; but some observers deny that in these cases the cardio-vascular changes of arterio-sclerosis[1] are a necessary accompaniment. As regards uricæmia it seems more probable that any relation which arterio-sclerosis may have with it is rather a relation with the diathesis than with the actual excess of uric acid in the blood.

This brings us to the most important group of alleged causes of arterio-sclerosis, namely, inheritance, age, and the arthritic and uric-acid diatheses. Rather than adduce old age as a cause, its relation is, perhaps, better put by stating merely that arterio-sclerosis is a disease of the second half of life, and very rarely attacks those younger. The arthritic and uric-acid diatheses are probably also rather associated conditions than standing to arterio sclerosis in any direct relation of cause and effect.

One fact seems certain, namely, that there is often an hereditary tendency to arterio-sclerosis, and this is especially the case where there is an "arthritic" family history.

One might suppose, indeed, as has been suggested to me, that in families which possess sufficient vitality and energy to adapt themselves to their surroundings, and which in consequence survive for many generations, there may, side by side with the resistance to tuberculosis and other diseases[2] which exterminate families who are physically too weak to adapt themselves to their surroundings; side by side with this resistance there may grow up a tendency to gout, arterio-sclerosis, and "degenerative" diseases, which may themselves, if unchecked, lead to the ultimate extinction of the family. This view does not, however, bring one to an end of the difficulties, and even in the hereditary cases of arterio-sclerosis alternatives present themselves; the hereditary ten-

[1] If, however, any influence of lead in the production of arterio-sclerosis be granted, it can still be maintained that this action is brought about through the medium of the nervous system, on which the action of lead is so well known.

[2] See the Milroy Lectures, by Dr. J. Berry Haycraft, in the Lancet, 1891, vol. i. Nos. 7-9

dency may be a tendency to a primary dystrophic process in the arterioles, or, as Lancereaux maintains, the faulty inheritance may lie entirely in the nervous system, the nutrition of the tissues being only indirectly affected. In like manner a nervous origin for gout and rheumatoid arthritis is being seriously entertained, and it would indeed simplify matters if we could rest here; but a history of mental strain and overwork, or rather, as Sir Dyce Duckworth would say, "irregular work," is certainly not necessarily present in cases of arterio-sclerosis, nor are the symptoms of any nerve trouble necessarily present.

If it be permissible to venture a somewhat vague suggestion as to what is one of the most probable causes of arterio-sclerosis, it is that what may be termed "excess" in its sometimes necessary and often long-continued forms seems, in the present state of our knowledge, to have the greatest share in the production of arterio-sclerosis. By such "excess" I mean merely a "strained" manner of living, which can by no means always be associated with any expression of reproach. It may be excess in physical labor; it may be excess and irregularity in mental work, including anxiety and worry; it may be the habitual taking of too much or too little food, from over-indulgence or insufficient means, both of which are so often accompanied by mental worry and anxiety. Such agents—or, rather, combinations of them—seem to be likely factors in the production of arterio-sclerosis; they can act on a single individual or cumulatively, through several generations, on a family.

On the whole, however, although such hypotheses appear very tempting, it must be admitted that the etiology of arterio-sclerosis remains as yet uncertain; but the condition must still be regarded as a primary one in pathology, though in some way allied to some of its alleged causes.

THE THERAPEUTICS OF INFECTIOUS PROCESSES IN THE NERVOUS SYSTEM.[1]

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A consideration of the treatment of infectious nervous processes involves not only the treatment after infection has occurred but also its prevention. The latter is not the least important part of our subject, and to it we will first give our attention.

[1] Third paper in the discussion on "The Influence of Infectious Processes on the Nervous System," before the General Session of the Congress of American Physicians and Surgeons, June 1, 1894.

From much that we know we have reason to believe that the occurrence of infection is markedly influenced by the nervous system. Charrin and Ruffer, in experiments on animals, discovered that section of the sciatic nerve under certain conditions favored pyocyanic infection. Roger cut the sympathetic nerve in the neck, and saw erysipelas which he had inoculated into the ear of the same side disappear, while on the other side it continued to develop. In another instance, instead of the sympathetic this investigator cut the auriculo-temporal nerve, when the reverse result was observed, for the streptococcus developed more readily on the side of the section. Not only did he prove that the nerves influence the process, but that different sections produced different results. Startling as are these facts, they are, after all, in harmony with what we know of the control which the nervous system exercises over all of the functions of the economy. Not only does it dominate digestion, circulation, and nutrition in general, but also absorption. The vasomotor nerves, through their influence on the size of the vessels and probably on the size of the stomata of the capillaries, are a powerful factor in determining the result. It is probable that the destructive inroads of germs are at times favored and at other times delayed or prevented by their action. Thus when the vessels are constricted and small it is probable that invasion can take place with little or no interference on the part of the organism. On the other hand, if the vessels be in their normal condition or perhaps a little dilated, it is probable that the white blood-corpuscles pass out into the surrounding tissue and act as phagocytes upon the invading germs, and that, in addition, the liquid constituents of the blood exert an action both bactericidal and antitoxic.

If the rôle of the nervous system is so important, if the ingress of microbes is to so great an extent under nervous control, prophylaxis assumes an importance altogether peculiar. It becomes at once evident that our ability to resist infection depends largely upon the maintenance of a normal nervous tone—*i. e.*, nervous health. Indeed, we may here find a partial explanation of the difference of susceptibility displayed by persons exposed to infection under similar circumstances. That these thoughts are not mere speculative fancies is proven by such experiments as those of Charrin and Roger on the rôle which fatigue plays on the evolution of infection. These experimenters constructed an apparatus, on the principle of the squirrel-wheel, by means of which they brought about marked muscular fatigue in animals. They conclusively proved that this fatigue distinctly favored the development of infection. Thus, in one series of their experiments they used thirty-six rats; of these they reserved fifteen as control animals. Twenty-one they inoculated with the germs of charbon, and then by means of their apparatus caused them to walk for from two to eight hours daily for three days in succession. It was found that the resistance of the animals

to inoculation varied according to age and size. In each series of experiments the investigators were careful to employ specimens of nearly equal size, taking care to preserve one, if any the smallest, as a control animal. All were inoculated into the skin of the flank. Three of the control animals withstood perfectly nine drops of the virus. The same dose was administered to eight others who were then subjected to the fatigue test. One of these resisted the inoculation fully, a second died at the end of four days, four at the end of three days, and two on the day after the inoculation. By increasing the dose, the experimenters were able to kill one of the control animals, but the latter did not die until at the end of five days. Further studies made by them yielded the same results, and in every instance, both by microscope and cultures, they verified the cause of death. The bacteria were always discovered in the blood. By their experiments they were also led to believe that fatigue favors infection from the intestinal tract. The conclusions to be derived from these researches are so clear as to be self-evident.

We have learned from the investigations of Hodge that nerve cells undergo certain changes in the course of their functional activity and that these changes can only be interpreted as those of fatigue. When analyzed they resolve themselves into simple loss of substance. That there may be in addition other changes less tangible—changes which are attended by the formation of products the result of retrograde metamorphosis—is also probable. However, the simple story of the tissue waste teaches us a fact of great significance, for loss of substance being synonymous with fatigue, it must also be taken as synonymous with weakness, and, in virtue of the rôle that the nervous system seems to play in infection, this weakness must be construed as synonymous with a diminished power of resistance to the invasion of germs. The first problem, therefore, that presents itself is the prevention, if I may be permitted to so state it, of undue waste of nervous substance through undue or excessive fatigue. To repeat what is known to every physician, that long-continued overwork, with insufficient rest and food, favor the development of various diseases, may seem unnecessary here, but that we are now in a position to frame an intelligent hypothesis based upon the experiments of Hodge, Charrin, and Roger, and others, is certainly interesting and important. The value or rather the absolute necessity of a proper proportion of sleep and a proper amount of food follow as unavoidable corollaries, but another element must also be considered. It not only suffices that the nerve cell should have rest and that sufficient pabulum for its regeneration should be at hand, but, to repeat what is universally known, exercise both mental and physical within physiological limits is absolutely necessary. The solution, therefore, of the question of a proper prophylaxis is answered thus far by a proper proportion of food, rest,

and exercise. The nervous health is, of course, influenced by numerous other factors concerned in general hygiene and special etiology; but these, I take it, do not directly concern us here. Simple as the conclusions with regard to general prophylaxis appear, their value must not be underestimated. To realize that overwork leads not only to nervous exhaustion, a fact with which the laity are as familiar as ourselves, but that it also opens the avenues of infection, is one which should be appreciated in its broadest significance.

The question next arises: "Are there any means of *special* prophylaxis against this or that infectious nervous disease?" Here, unfortunately, the answer which we can give is hesitating and clouded with uncertainty. At once the preventive inoculations of Pasteur, Behring, and Tizzoni and Cattani, suggest themselves, but at the same instant doubts as to the advisability and applicability of the methods arise. Roughly speaking, the question of preventive inoculation for infectious nervous diseases must be answered, as we shall see farther on, in the negative. However, special prophylaxis appeals to us from another quarter. Supposing that the general economy is already the subject of bacterial infection, are there no means by which the spread of the infection to the nervous system can be averted or the chances for such infection diminished? Is there anything that can be done in the various infectious fevers, in general pyæmia, in suppurative otitis media, in lung abscess, empyema, etc., to prevent nervous involvement? Are there any means by which the meningitis, brain abscess, and neuritis, that every now and then make their appearance in the course of these diseases, can be prevented or the chances of their occurrence lessened? With regard to abscess, the question may often be answered in the affirmative, but at times the involvement of membranes, centres, or nerves is to be explained either by the excessive virulence of the infection or by the special susceptibility of the nervous system to the poison in question. At times, too, secondary involvement of the nervous system is to be regarded as related to the sudden suppression of some local symptom, as a purulent discharge or perhaps an eruption.

Where the nervous system is threatened by the existence in other structures of foci of infection, abscesses, and suppurating cavities, such as purulent otitis, mastoid disease, purulent inflammation of the frontal sinuses or of the orbit, lung abscesses, empyema, the indications as to prophylaxis are very clear. A suppurating cavity, be it large or be it small, constitutes a perpetual danger, and the importance of securing free evacuation and free drainage, wherever such a cavity is situated, need not here be dwelt upon.

Practically, we must admit, questions of general and special prophylaxis are presented to the physician far less frequently than questions of treatment after infection has actually occurred. Here the problem

again resolves itself into general and special methods. The general indications are of course clear. They are: first, to arrest or limit the infective process; and, secondly, to bring about a rapid elimination of morbid products, toxines, etc., or the evacuation of tissue detritus, such as we find in purulent inflammations, abscesses, and the like. The first indication, namely, to arrest the infective process, is easier proposed than carried out. Unhappily we are not yet possessed of a germicide which will enable us to bring about the death of germs within the nervous system without injury to the tissues. Such a substance would be one that would act upon microbes as quinine appears to act upon the organisms of Laveran. It is in this field that chemistry and the biological laboratory may some day yield us a great discovery.

In the meantime Pasteur, Koch, Behring, Kitasato, Tizzoni and Cattani, and others have attempted the solution of the problem on an entirely different basis. The familiar fact that the growth and multiplication of the torula is arrested by the very alcohol to which it gives rise, seems first to have suggested the attempt to combat the infectious microbes by the toxines which they themselves produce. However, with the possible exceptions of tuberculosis and leprosy, the symptoms produced by infectious micro-organisms appear to be due not so much to the germs as to these very toxines. Notwithstanding, these attempts have led to very interesting and in some instances very valuable results, and these we will briefly review.

As regards tuberculosis the story of the hopes and failures of Koch's lymph is too recent to bear repetition. In tuberculosis of the nervous system the lymph is shown to be not only useless but even dangerous. This is the experience of Brehm and others in tuberculous meningitis, and even if it be given for tuberculosis of other structures tuberculous meningitis may arise during its use. Caspersohn, for instance, observed such meningitis develop while he was treating his patient for tuberculous fistula and abscess of the right thigh and hip.

In the treatment of leprosy by the lymph, failure appears to have been almost equally marked. The writer has collected in all sixty-four cases treated by Koch's lymph in 1891. Not a single cure was reported among them all. Poupinel noted considerable improvement in two cases out of five. Kaliendero and Babès noted amelioration and improvement of general condition in eleven. Schwartz noted improvement in a number out of twenty-two cases, but did not follow them up. Goldschmidt noted improvement in one out of ten. It appears that even these general statements of amelioration and improvement must be taken with considerable allowance. Danielssen, after having treated fourteen cases, comes to the following conclusions: First, that there is a local and constitutional reaction which comes on from four hours to three days after the injection of the lymph. The local reaction occurs

later. Second, that the reaction has no favorable influence upon the leprous trouble, but on the contrary it aggravates the latter. Third, that the tuberculin does not destroy the lepra bacillus, but that it fertilizes the soil for the latter, the bacilli increasing in activity and destructive qualities more than if the patient had received no treatment. Finally he concludes that the method can produce a kind of immunity when the tuberculin is used for a long time, but that the method does not arrest the progress of the disease, for new symptoms may develop under its use. Whether modifications of the lymph or such methods of preparation will yet be devised as will eliminate all elements of danger, and whether it will finally be successful, can of course only be conjectured.

When we turn our attention to Pasteur's efforts with hydrophobia the story is decidedly more encouraging. It is obviously out of place here, nor would time permit us, to go into a detailed discussion of Pasteur's methods, nor to consider in detail the claims and criticisms of his practical results. However, a brief review of his methods is necessary for our purpose. As is well known, Pasteur found that if the spinal cords of rabbits inoculated with rabies are kept in a room with a constant temperature of 20° C. (68° F.), they gradually lose their virulence with each day's action of the dry atmosphere and the surrounding temperature until, after the expiration of fourteen days, a material remains which produces no perceptible action upon rabbits or dogs when introduced into the brain. It does, however, protect the animal against future inoculations with most active forms of the virus. It appears that the process of drying destroys the germ (whatever that may be), but leaves the toxine produced by the germ practically unchanged. Pasteur obtained his virus by inoculating rabbits beneath the dura mater with the spinal cord of the rabid dog. Then, this rabbit having developed rabies, its spinal cord is inoculated into a second rabbit, and this process is repeated until finally it is found that the virulence has increased to such an extent that a small particle of the cord injected into a rabbit will kill in seven days. The spinal cord of the last animal is then attenuated in dry air as described above. A small fragment of this material is then diluted in sterilized bouillon. These injections are repeated with material obtained from cords of greater virulence until finally a very virulent material is injected, when the animal is found to be immune. Pasteur applied his method to the treatment of patients suffering from the bites of rabid animals, by beginning with material obtained from cords that had been dried for a period of fourteen days and by steadily following the initial injection with material obtained from cords of less attenuation until at last the cord of one day's drying was used. The injections were made under the skin. The theory of Pasteur is that a gradual accommodation of the organism to the virus occurs.

As is well known, Pasteur's claims were confirmed by the English Committee of Investigation. This committee reported that the experiments of Mr. Horsley entirely confirmed Pasteur's discovery of a method by which animals may be entirely protected from the infection of rabies; and further, that the personal investigation of Pasteur's cases by members of the committee was, so far as it went, entirely satisfactory, and convinced them of the perfect accuracy of his records. Among those who have also given attention to the question of hydrophobia experimentally must be mentioned Tizzoni and Cattani. These investigators experimented with the vaccine extracted from the central nervous system of rabbits dying from fixed virus, though even a vaccine prepared from the first generation after inoculation gave positive results. Ten cubic centimetres of their liquid contains dissolved the active principle of about one gramme of rabic nervous system. This solution failed absolutely to produce rabies by experimentation, and was entirely aseptic. With this liquid they succeeded in making twelve out of fourteen rabbits entirely immune. In the two in which preventive inoculation had been unsuccessful the quanitity administered seemed to have been insufficient. Tizzoni and Cattani concluded that one inoculation is sufficient, and that even on the following day the animal may be inoculated with rabic virus without developing the disease. They further proved that their vaccine was efficacious even when administered during the incubation period of rabies, though a larger dose is in such a case necessary. They concluded, however, that in the case of rabbits the treatment must not begin later than four days after the infection.

More recently Tizzoni and Cattani made the interesting discovery that in sheep and dogs which had been injected under the dura mater with rabic nervous system the serum acquired an anti-rabic value. This anti-rabic quality increases in intensity until the twenty-fifth day after vaccination—that is, subdural inoculation—and then begins to decrease. This is the time when the serum should be removed from the animal. The serum, they claim, produces no unpleasant effects whatever and is absolutely lacking in virulence. These interesting and original observations are in harmony with those made previously by them regarding the immunizing and therapeutic effects of the serum of rabbits that had been rendered immune by vaccination with the rabic virus. The scientific importance and wide significance of these discoveries cannot be overestimated.

The story of the extensive application of Pasteur's methods, his extravagant claims as to results, together with the active opposition they aroused in certain quarters, is still too recent to bear repetition. In Paris itself his claims, as is well known, have been actively combated by Lutaud, who showed that in France over a period of twenty-three years (1850 to 1872) there were but 685 deaths from rabies—that is,

about 30 a year. Pasteur claims that during the five years 1881 to 1885, there were 60 deaths in the hospitals of Paris. This is disputed by Lutaud, who cites cases with the hospitals at which they were treated, showing only 26 deaths. Again, Pasteur claims that the annual mortality for seven years up to 1870 is 76; Lutaud proves it to be 47.7. Vulpian states, in Pasteur's name, that the number of persons bitten by rabid dogs in one year was 100 and the number of deaths 16, and that these occurred in persons not treated by the Pasteur method. He then follows this statement by saying that out of the 1726 cases treated only 12 died in place of the 276 who would otherwise have died without treatment. Lutaud called attention to the remarkable increase of the number of cases of rabies implied by these statistics. Pasteur says that of 1929 Frenchmen treated 18 died up to December 31, 1886; all told there were 2682 cases of hydrophobia. Lutaud then shows that the cases of death in the Pasteur Institute during the year 1886 numbered 22, and further that there were also 17 deaths without treatment, making a total of 39 deaths for the year 1886, which is an excess over the mean annual mortality of previous years, which was 30. From 1886 to 1890 there were 90 deaths after Pasteur's treatment had been employed. The cases, names, addresses, etc., are recorded. If we add to this the number of deaths of those not treated, we have the figures 154, a mean of 38 deaths a year.

Among the opponents of Pasteur's methods must also be mentioned Dulles, whose criticisms have been exceptionally severe, as the following citation from a paper read before the recent meeting of the State Medical Society of Pennsylvania will show:

"The number of cases of hydrophobia that occur in this country is happily small. It would doubtless be smaller still but for the exploitation of the Pasteur Institute conducted by Gibier in New York, and of its feeble imitator conducted by Lagorio in Chicago. These institutions and the newspapers that, in times past, have published sensational accounts of cases of so-called hydrophobia, have in a mild way reproduced some of the conditions which make France the hotbed of hydrophobia as well as of hystero-epilepsy. But the psychological make-up of Americans is less favorable to the development of the germs of hydrophobia or those of hystero-epilepsy than is that of the French, and consequently there is less of either here than there is in France. There the history of the last six years differs but little from that which I described to you in my last report. As then, so now, the number of deaths in France is greater than it was before Pasteur, just ten years ago (in May, 1884), boasted to a newspaper reporter: 'Whoever gets bitten by a mad dog has only to submit to my three little inoculations, and he need not have the slightest fear of hydrophobia.' The year before he made that boast there were 4 deaths from hydrophobia in Paris (the department of the Seine); the year after, when he had practised his preventive method for six months, the deaths from hydrophobia leaped at once from 4 to 22. In 1886 the number fell to 3 again in Paris; but I have a list of 23 persons that died after treatment by Pasteur himself in that year. In 1887 the deaths in Paris rose to 9, in 1888 to 19. These oscillations indicate that Pasteur's method is no more preventive of hydrophobia than is the method which he declared, in 1884, would eradicate rabies in dogs. On the contrary, Pasteur's method

has undoubtedly increased the number of deaths from hydrophobia. I have indicated what has taken place in France and can assure you that there has been no diminution of the number of deaths from hydrophobia in any part of the world since Pasteur's infallible cures were inaugurated; and at the same time there has been added to these a large number of deaths due to inoculations with virus of what ought to be called 'Pasteur's disease.' Just how many these have been, no man can say. The statistics in regard to these deaths are confusing. Those from friendly sources contain remarkable discrepancies. Pasteur's own statistics, published in the *Annales de l'Institut Pasteur* for March of this year, admit 72 deaths in seven and one-half years after treatment in Paris. My own statistics show a much larger number, while I find that Dujardin-Beaumetz, an enthusiastic supporter of Pasteur, reported to the Académie de Médecine on June 21, 1892, 98 cases in only six years, which is just 26 cases more than Pasteur himself reported for eight years. One way in which such curious figures appear may be seen when we examine Pasteur's detailed report for 1893, when we find that 10 actual deaths are set down as 4, because 2 of the 10 unfortunates succumbed in less than fifteen days, 3 developed their fatal disease while receiving the inoculations, and only 1 did not stay to have the treatment completed. The same manipulation may be found in the reports for other years."

In the limited time at our disposal a detailed review of the evidence pro and con of Pasteurism and hydrophobia is impossible. However, it is vain to deny the truth of Pasteur's experimental researches upon animals, while the evidence as regards human beings is in *specific* instances strong and convincing. It goes without saying that of the number of dogs who inflict bites upon human beings a percentage only are rabid, and finally, that of the number of persons bitten by rabid dogs only a portion become infected with the disease. The publication of Pasteur's methods, the wide distribution among the laity of information concerning his treatment, and the well-known predisposition of the French to hysteria, have increased enormously the number of persons who have directed medical attention to bites received by them, and in this way is doubtless to be explained the enormous increase in the number of cases.

However, in a disease the mortality of which untreated is practically 100 per cent., any method of treatment that yields even a ray of hope deserves trial. Inasmuch as the period of incubation is generally prolonged, there is certainly time for giving a patient the benefit of Pasteur's method. It would seem that the rational course in a given case would be to remove the spinal cord of the supposed rabid dog, and to perform with it test inoculations upon rabbits, and having determined the actual existence of rabies by this means, to rapidly prepare attenuated material. The evidence shows that the risk involved by the injection of such material is exceedingly small. Let us hope that the discovery of Tizzoni and Cattani, of the anti-rabic value of the serum of dogs and sheep upon which subdural inoculations have been practised, will lead to a simpler and more direct method.

When we turn our attention to the subject of tetanus we find the existing state of investigation to be more interesting still. In 1890,

Kitasato attempted to make animals immune to this disease. His attempts by means of repeated inoculations of attenuated virus failed to yield a satisfactory result. However, by applying the method which Behring had devised in experiments with diphtheria, he finally succeeded. He first injected a middle-sized rabbit with 0.3 cubic centimetre of the filtrate of tetanus culture subcutaneously. Immediately afterward he injected into the same area 3 cubic centimetres of a one per cent. solution of iodine trichloride. In twenty-four hours the same dose of iodine trichloride was again administered. In forty-eight hours some symptoms of tetanus infection having appeared, the dose of iodine trichloride was again repeated, and twice thereafter; in all, five doses were administered before tetanic symptoms finally disappeared. The animal was entirely well in ten days. On the fourteenth, eighteenth, and twenty-fifth days large doses, 2 to 3 cubic centimetres, of tetanus culture were administered with negative results. Two control animals which received but a moderate dose of the culture, died in a few days. This method was successful in producing immunity in 40 per cent. of the animals experimented upon, and further, this immunity persists for two months. Experiments were further made to render other animals immune with the blood of immunized rabbits. Kitasato injected liquid blood, before coagulation, into the abdominal cavity of mice, who, with control animals, were subsequently inoculated with tetanus bacilli, and in such a dose that the control animals died in thirty-six hours; the others remained immune. The serum also revealed therapeutic properties. An animal could be infected with tetanus, and after symptoms had appeared, successful results were obtained by injecting the serum into the abdominal cavity. He further proved that when the filtrate of tetanus culture is mixed with the serum of the tetanus-immune rabbit, it fails to kill the mice, while control animals perish. Behring also experimented extensively in the same field, and found that iodine trichloride added to his carbolized tetanus culture in increasing doses, made the culture less and less virulent, and finally innocuous. Rabbits which survived injections of this mixture were able to stand more than the minimal dose necessary to kill control animals, and thus attained a certain degree of immunity which, through further inoculation with culture-fluid, became greater and greater. Behring also, and Schuetz later, demonstrated the possibility of thus immunizing horses and sheep.

More interesting than all, however, are the combined researches of Brieger, Kitasato, and Wassermann. To begin with, they noted that when they attempted to grow the tetanus bacillus in a watery infusion of thymus gland, they were only occasionally successful. They then made the remarkable observation that the tetanus bacillus, though it grew, failed utterly to develop spores. Even when they submitted the cultures to the incubator for as long a period as fourteen days, the result

did not vary. However, when these sporeless bacilli were transferred to other culture media they again developed spores. That is, the tetanus bacillus simply loses the power of spore-bearing while in the thymus infusion. These investigators then followed up this discovery by inoculating animals with cultures made in thymus infusion, with the result that they were able to produce immunity in all of the animals experimented upon. While the trichloride method yielded 40 per cent. of immunized animals with the immunity persisting for two months, the thymus method yielded immunity in 100 per cent., and at the end of four months this immunity was as marked as ever.

Behring, Frank, Kitasato, and Tizzoni and Cattani were successful in conferring immunity upon other animals by the injection of immunized serum. They all demonstrated also that this serum possessed in addition curative properties; that is, animals in which tetanus had been produced by inoculation, and which were afterward treated by injections of immunized serum, recovered, while control animals perished. Further, they all found that the dose required to bring about a cure was far greater than that necessary to bring about immunity. The practical application of these striking and brilliant results in the cure of tetanus in man, possesses an interest that is altogether peculiar. In a disease, the mortality of which is variously estimated at from 75 to 90 per cent., being second only to hydrophobia, the introduction of a really successful plan of treatment would rank as one of the greatest achievements of modern medicine.

Inasmuch as the quantity of serum which could be derived from mice and rabbits was obviously too small to be available in man, Behring experimented upon horses and sheep. Even under these circumstances it seemed at first as though the quantity of serum required would be too large to be practicable. However, it was found that the serum of the immunized animals increased in strength with time, and Behring finally succeeded in immunizing the serum of horses until it attained an immunizing value of 1 to 1,000,000 body-weight. Of this serum one gramme will be sufficient to immunize 1000 animals of 1000 grammes body-weight each, against a minimal fatal dose of tetanus culture.

According to Behring and Frank, and also Tizzoni and Cattani, the healing value of the serum is 1000 to 2000 times less than its immunizing value. Therefore a serum which has an immunizing value of 1 to 1,000,000 would have a curative value of only 1 to 1000. That is, for every kilogramme of body-weight one gramme of serum should be used. Again, in cases in which the disease has already advanced, or in which the infection has already produced severe symptoms, a still larger quantity must be employed. It was a serum of this strength that was applied by Rotter in the treatment of a case of tetanus in man. The patient was a male, twenty-five years of age, who had developed tetanus

after a wound of the hand. The first injection was not made until seven days after the appearance of trismus. 66 grammes of immunized horse-serum, containing 0.5 per cent. of carbolic acid, were injected into four places beneath the skin of the back. On the day following, his condition remained unchanged. A second injection of 50 grammes of the same serum was now administered. The seat of the injection was the left pectoral region, the needle being turned in different directions. The pain caused was slight. On the following day the patient expressed himself as feeling decidedly better. Trismus and rigidity of the back of the neck and of the legs were somewhat lessened, though not markedly so. Twitching ceased. 45 grammes of serum were now administered into the left Mohrenheim fossa. No reaction was noticed at the punctures or area of the injections. Distinct improvement was noticed on the following day in all of the symptoms. The fourth and fifth injections were then administered on successive days. The symptoms now steadily improved, though slowly. On the seventeenth day, after the last injection, the patient was dismissed from the hospital, with a slight rigidity of the left forearm, which five days later entirely disappeared.

Another interesting case reported is that of Moritz. Behring had succeeded in bringing up the immunity of the serum of a horse to so high a value that it was estimated to have an equivalence of 1 to 10,000,000 —that is, 1 cubic centimetre would be equivalent to rendering immune 500,000 mice of 20 grammes each, or 143 human beings of 70 kilogrammes each, against a minimal fatal dose of the tetanus poisoning. These figures seem almost incredible.

It was such a serum that Moritz used in a boy twelve years of age. Unlike Rotter's case, the attack of tetanus did not follow a trauma. One week after the appearance of trismus 20 c.c. of an immunized serum were injected into the inner side of the left thigh, while 10 c.c. were injected into the corresponding portion of the right thigh, and 20 c.c. into Mohrenheim's fossa. The next day 30 c.c. additional were injected, while on the day following, 15 c.c. more were given—in all, 95 c.c. By this time such decided improvement had set in that the injections were discontinued. Three weeks after the beginning of the treatment the boy was able to walk, and some ten days later resumed his school.

In Italy this method of treatment has been employed in quite a number of cases, as many as twelve having been thus far reported. Tizzoni and Cattani, from their experiments, came to the conclusion that for practical purposes in man, when the strength of the serum has reached 1 to 1,000,000 it is most fit for use, and that the value of the serum depends only on the amount of the antitoxine it contains and not upon its origin—that is, not upon the particular animal from which it is derived. It would be unnecessary, therefore, in a case of urgency to wait until increasing injections had afforded a maximum intensity to the serum,

but to at once ascertain the strength of the latter and then to administer it in a proportionate dose.

These investigators also showed that the alcoholic precipitate derived from the serum is of the same value as the serum itself; though Behring maintains that the antitoxine does not exist in Tizzoni and Cattani's dry powder in its purity. Behring also estimates the value of Tizzoni's antitoxine as but 1 to 10,000. It would, therefore, have a far lower value than that of Behring's serum. Tizzoni estimates that of his serum, 70 c.c. would be the dose for a case of moderate severity in man in the beginning. At a later stage, 210 c.c. would be required. This would equal of the alcoholic precipitate 5 to 6 centigrammes in the first instance and 10 to 12 grammes in the latter.

The writer has collected in all some thirty-four cases of tetanus of various origins, treated either by the powder of Tizzoni or by the immunized serum. Of these, twenty were successful; certainly a large proportion. However, it is not improbable that in some of these cases the recovery was brought about not only by the antitoxine employed, but also by other measures, *e. g.*, amputation or early active treatment of the wound. Further, in the majority of the Italian cases the period of incubation was relatively long and the cases, as a whole, seemed of a mild type. Certainly they were neither very acute nor very severe. Rotter in his criticism of the first eight Italian cases goes so far, indeed, as to maintain that not one of them taken alone can be considered as proving the curative properties of Tizzoni's antitoxine. Finally, it is to be feared that in the long list of successful cases reported, the unsuccessful ones have been most unwisely omitted. If this suspicion be incorrect, the twelve Italian cases, notwithstanding their mild character, constitute a strong argument in favor of Tizzoni's antitoxine. A number of successful as well as unsuccessful cases have also been reported in Germany and France. Thus Roux and Vailliard were successful in two cases, unsuccessful in five; Renon was unsuccessful in two; Escherich successful in one, unsuccessful in three; Range lost two; Baginsky and Kitasato lost one; Schwartz another. The unsuccessful cases appear to be as much open to criticism as the successful ones. In some the treatment was begun too late, in others an insufficient dose seems to have been administered; in others still, the serum appears to have been insufficient in intensity. In the successful cases the symptoms are never abruptly arrested but disappear slowly, the case often running a prolonged course.

Various speculations have been advanced regarding the method of action of the antitoxine. Tizzoni and Cattani, for instance, believe that the treatment does not so much affect the symptoms that are already present as that it limits the spread of the disease by immunizing or protecting the portions of the nervous system not already affected; that for

this reason it has little or no influence on the symptoms already developed. Thus they proved that when the injections of tetanus culture exceeded a certain amount, or the symptoms had widely progressed, the serum was insufficient to cure.

It is, however, extremely probable that the antitoxine possesses the property of directly destroying the tetanus poison. This is the position assumed by Behring. It is difficult to reconcile the theory of immunity with any other hypothesis. A statement of practical, even if of negative importance should be added, and that is that there exists no contra-indication to the use of the serum or of the antitoxine. Its employment appears to be in no way injurious. While the evidence regarding its actual therapeutic value is unfortunately inconclusive, it is still to be hoped that further trial will yield a decisive answer. The promise held out is so great that it not only justifies but absolutely demands this further trial. We learn from Behring that the serum can very readily be preserved by the addition of 0.5 per cent. of carbolic acid, while Tizzoni's results show that in the form of a dry powder it retains its virtues for a long time, and it is not improbable that the methods of preservation will yet be so far perfected that, like other remedies, they can be preserved for long periods and used at will.

The methods indicated by the researches of Pasteur, Koch, Behring, and Tizzoni are not apparently to be limited to the diseases we have thus far discussed, for from Behring we receive the hope that they may also be applied to the treatment of diseases due to streptococcus infection. When we contrast these methods, based as they are upon scientific investigation and deduction, even when we examine most critically the practical results, we realize that the hope they offer of a final conquest of these terrible diseases is nothing less than sublime.

The various other means at our disposal for combating infectious nervous processes resolve themselves into general remedies, drugs, and surgical procedures. It would obviously be out of place before an audience of this character to review well-established and well-recognized principles of treatment pursued in the various infectious nervous diseases, and I deem it my province here to touch simply here and there upon that which may be new. Unfortunately, little that is new can be said under any of these heads. Cold has been applied with varying success, as is well known, in meningitis, both cerebral and spinal, though one of the later writers (Brehmer) saw ill effects follow its use in children. Heat also has a comparatively limited application; Horsley proved experimentally that in hydrophobia it is worse than useless. Baths are rarely employed in infectious nervous diseases. It is not improbable that they would prove of benefit. From the remarkable results of the Brand method in typhoid fever the question arises whether the therapeutic result is due only to the falling temperature, or perhaps to some

other action of the water, and it has occurred to me that in such affections as tetanus and cerebro-spinal meningitis repeated and prolonged immersion in water of suitable temperature would be a justifiable expedient. Whether by this means the elimination of toxines would be favored, is a matter that can at present only be conjectured. It is interesting in this connection to note that T. J. Bennett, of Texas, reports a successful case of tetanus cured by frequent immersion in hot baths of from thirty to sixty minutes' duration.

When we turn our thoughts to treatment by drugs we meet little that is either encouraging or gratifying. For hydrophobia the treatment by drugs is equivalent to zero, and for tuberculosis of nervous structures their value cannot be said to be any greater. As regards tetanus, to the various drugs, bromide, chloral, morphine, and the other sedatives that are so familiar to us, a long list, self-condemnatory by very reason of its length, is constantly being added day by day. It includes such drugs as carbolic acid, eserine, strychnine, salicin, pilocarpine, aconite, antipyrine, and even the poison of the rattlesnake.

As regards leprosy, benefit is said to have followed the use of gurjun and of chaulmoogra oil used internally and externally. Chlorate of potash in almost toxic doses is said also to have been followed by good results. Europhen yielded benefit in one case and proved useless in four others. As regards chorea, which, though not demonstrably infectious, is probably so, quinine has recently been advanced by H. C. Wood as possessing unusual value. Extensive trial has, however, shown that it remains secondary in value to arsenic. Antipyrin has also its advocates, and especially is this true of exalgine, which Dana thinks has a specific influence in Sydenham's chorea.

On the whole, the literature affords little that is new on the treatment of infectious nervous diseases by drugs.

Surgical procedures enable us every now and then to accomplish definite and often brilliant results. This is especially true with regard to the evacuation of pus in positions that were formerly deemed inaccessible, *e. g.*, brain abscess, which is no longer the frightful and hopeless disease of former times. Indeed, it now constitutes, to use Macewen's words, "one of the most hopeful of all cerebral affections." It is earnestly to be wished that some surgeon will yet devise a means for the successful treatment of infectious diseases of the various membranes. Certainly, from what we know of their hopeless nature, purulent inflammations would justify even extraordinary procedures. In keeping with these thoughts, C. A. Morton tapped the arachnoid space in four cases of tuberculous meningitis and noted slight improvement in two of them, and Wallace, Ord, and Waterhouse trephined through the cerebellar fossa of a child of five years. A small quantity of fluid escaped, a drainage tube was inserted, and the child did well. In tetanus, also,

surgical interference has proved of great value in regard, of course, to the thorough antiseptic treatment of the wound, to excision, and to amputation.

In closing my part of the discussion—a part which I fear has been anything but satisfactory—I desire to make a suggestion in reference to the treatment of tetanus which may be of value. It will be remembered that Brieger, Kitasato, and Wassermann discovered that the tetanus bacillus, though it grew in thymus infusion, did not develop spores, and that animals inoculated with such cultures were made highly immune to the cultures of tetanus grown in other media. The thought suggested itself to me that if the thymus juice possesses such remarkable properties, it should be tested with a view to a possible therapeutic effect. Its administration in cases of tetanus beneath the skin could certainly do no harm, and might do good, and it might also be administered by the mouth, like the thyroid gland in myxœdema. If successful, it would prove far more valuable than the antitoxine, because so readily procurable.

FOOT-BALL AND THE PHYSIQUE OF ITS DEVOTEES, FROM THE POINT OF VIEW OF PHYSICAL TRAINING.[1]

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The object of physical training, as understood at the present day, is the normal symmetrical growth and development of the human body by means of a carefully selected system of graded and progressive exercise. The exercises may be divided into general and special, the former being applicable to classes and the latter to individuals according to their special individual needs. In the smaller colleges and schools the instructor in gymnastics superintends both forms of exercise, but in the larger ones a medical director takes charge of the special exercises, which are prescribed only after a most careful examination, such as only a well-educated physician can make. The exercises themselves are, for the most part, done in a gymnasium; certain games for children are played in the open air, as in the German system of gymnastics.

It seems to me that no two things are so often confounded as this system of regular exercises, taken in the gymnasium, and the practice of athletic sports. The drills in the gymnasium compare with athletic training about as the undergraduate course at a college compares with the post-graduate course. The management of the former is in the

[1] Read before the American Physiological Society.

hands of a responsible medical superintendent, that of the latter in the hands of an irresponsible (medically speaking) athletic committee composed mainly of ex-champions of the field. Systematized and supervised gymnasium exercise treats the body as a whole, and is perhaps less interesting to the partakers of it; athletic sports develop special parts to a high degree of perfection and are to some very attractive, but need corrective exercises to re-establish perfect symmetry of development, which is the object of systematized physical training.

History shows that the one great danger of all athletic sports is in their being carried too far, and a reaction in public opinion is the natural and inevitable result. Thus, some of our most prominent men and educators, as well as physicians of America and England, have quite recently placed their names on record as being very much against the *present tendencies* of some of our athletic sports, notably those of foot-ball.

Among the medical papers, especially have the *Medical News* and the London *Lancet* repeatedly commented on the game of foot-ball and on the number of deaths and of serious injuries directly traceable, not, as I understand them, to the game itself, but to the evils accompanying it.

By still others it is even held that foot-ball has ceased to be a gentleman's game, and that the modern foot-ball player, playing, as some do, for gate-money and other pecuniary rewards, stands on about the level of the professional prize-fighter, acrobat, India-rubber man, and other freaks.

On the other hand, according to its enthusiasts the game of foot-ball is by far the greatest ever invented—that such things as pluck, self-reliance, self-control, temperate habits, soldierly qualities, and discipline of any kind were unknown in the world before its introduction; we are quite *ex cathedra* informed that all these good and manly qualities can be properly developed only through the medium of foot-ball.

There being a great deal of truth and a great deal more of error and of exaggeration on both sides of this controversy, the question is, How much of this war of words is based on facts and how much on mere opinion?

Medical papers, unlike other newspapers, are published for but one class of people, namely, physicians, who are the natural guardians of public health and in whose direct line of duty it seems to lie to call timely attention to any danger threatening life and limb from any direction or cause whatsoever. When, then, the London *Lancet* for 1892 reports one hundred and nine grave injuries, among which were noted three cases of concussion of the brain, twenty collar-bone fractures, twenty-nine fractures of legs, five compound fractures, six fatal abdominal

injuries, with a total number of twenty-three deaths; when, furthermore, the *Medical News* reports five cases of death as having occurred in this country in 1893, due to foot-ball, any medical man would consider these statements well authenticated, and without hesitation would put them down as facts, reasoning from the standing of these two medical papers, for any necessity for their either suppressing or enlarging the facts does not exist; it is, on the contrary, much to their interest to publish simply the naked truth.

Granted though it must be that it would have been much better and more satisfactory if the collectors of the above facts had, at the same time, counted the total number of players of England and America, and also if they had taken the trouble to furnish us with brief but concise accounts of all the circumstances surrounding at least the deaths that have occurred—in other words, if the statistics had been more carefully taken—yet, from the above-mentioned data, so far as they go, it would nevertheless follow that the game of foot-ball as played at the present time is attended by a considerable number of injuries and even by a certain number of deaths; the percentage number of the latter, however, would certainly look rather diminutive if the total number of players were actually known.

These, then, are some of the admitted facts that form the basis for argument against the game, and that are now agitating the public mind as well as the minds of college faculties.

Turning to the other side of this question, if we examine the foundations for the argument in *favor* of the game of foot-ball, the absence of solid facts becomes at once most apparent. It is positively discouraging when one realizes the large amount of writing extant upon foot-ball events and upon the game itself, and the time that the student of these matters is compelled to expend in reading these accounts—without, in the end, finding himself rewarded with one single solid substantiated fact or result, except those existing for the most part in the imagination of over-enthusiastic advocates of the game, and which are consequently neither ponderable nor measurable, but a fine and highly refracting collection of rhetorical soap-bubbles that will not stand critical examination.

It would seem, so far at least, as if the opponents of foot-ball had the advantage of the argument, and it now becomes the duty of the friends of the game who would like to see it perpetuated to produce, if possible, *facts* that are calculated to neutralize the disadvantages alleged. The foot-ball season with all its excitement being over for the time being, the opportunity for considering the arguments pro and con seems too favorable to be allowed to pass. Let us, therefore, see what are the facts that would argue in favor of the game from the point of view of physical training.

In the autumn of 1892 we determined to make some observations on the influence of foot-ball as an out-of-door exercise on the human physique, so far as that influence can be ascertained by certain anthropometric measurements, taken on the players, at certain definite intervals of time. In order to obtain a standard for a beginning, we tried to measure a few of the visiting "teams" as well as our own. We, very soon, however, were made most painfully aware of the great difficulty of our task from more than one point of view. In the first place, it was found to be an unusually difficult undertaking to attempt to induce a visiting foot-ball "team," solicitous about the result of the contemplated match game, to submit to being measured to the extent that is necessary for obtaining accurate and valuable results an hour or so before the game begins. It is simply useless to inform them that it cannot possibly hurt a man in training for foot-ball to squeeze and pull about a few manometers. In the second place, whatever was done had to be done quickly, and the danger of all quick work is that accuracy must be more or less sacrificed.

For these two reasons we deem ourselves rather fortunate in, nevertheless, succeeding in getting the measurements of five visiting "teams," the success being almost entirely due, rather to the winning and persuasive ways of some of my more diplomatic associates on the athletic committee than to my own efforts.

Inasmuch as our work in this direction is believed to possess a certain definite value not only as regards the subjects of physical training and anthropology but also as regards the present foot-ball question, the publication of some of the results seems both desirable and timely.

The points that were more especially taken notice of were the age, height, weight, lung-capacity, and "total strength" of each individual player, and the position which he occupied on the field.

Table I. is intended to give but the averages of each eleven on the different "teams" named:

TABLE I.

Names.	Age.	Height.	Weight.	Lung capacity.	Total strength.	Time of measurement.
	Yrs. mos.	Mm.	Kilo.	Litre.	Kilo.	1892
University of Pennsylvania .	22	1810	80	4.604	624	Oct. 12
Princeton	20 8	1800	80.9	4 883	730,5	" 15
Lafayette	20	1760	77	4.260	642	" 22
Franklin and Marshall . .	22 4	1720	73	4.112	602	" 29
Rutgers	20 7	1780	77	4.833	686	Nov. 5
U. S. N. Academy . . .	20	1780	73	5.094	730	Oct 21
U. S. N. A. "Hustlers" . .	19	1760	71	4 456	617	" 21
Averages (French) . .	20 8	1773	76	4.557	662	No. of observ. 77
Averages (English) . .	20 8	69.8 in.	167 lbs.	278 cb.in.	1456 lbs.	

The French system of weights and measures is now almost exclusively used in anthropometry, but for the convenience of the English reader the averages have been converted into the English system. The only item needing a more detailed description for an intelligent understanding of this and the succeeding tables is the "total strength." The total individual strength was included in our observations from the quite natural inference that the game under consideration is one in which the strong and hearty are much more apt to engage than those less plenteously endowed by Nature as regards the size and quality of their muscles. An account of the method of ascertaining this total strength will, therefore, be given under the head of "total strength."

It will be noticed in Table I., by the names of the teams there represented, that several of the larger universities and colleges, as well as some of the smaller ones, are included. The two naval teams may, perhaps, be considered as standing between these two classes. The combined averages of the seventy-seven players, consequently, ought perhaps to answer pretty nearly to the description of the average American foot-ball player as he is at present. The table represents a great deal of labor in a small space, and contains in many respects a great deal of information not apparent at first sight, but, before analyzing it further, let us turn our attention to some other observations, and consider in detail the changes that were produced in the different items under observation by a course of foot-ball training, lasting, as it does here at the Naval Academy, two months.

1. HEIGHT. As regards height, I may at once dismiss this item by stating that there never was any appreciable change produced in it during the above-mentioned period of two months' training, and the heights are given in the tables for reasons that will become more apparent as we proceed. I must add that I do not wish to be understood by this statement as asserting that the height of foot-ball players is never changed during the training period, but merely that, so far as these observations have extended, such changes have not been observed. Growth in height, however, does not stop in those having undergone training who are still of an age at which development cannot have been completed, for I have observed it to take place after the period of foot-ball training was over.

2. WEIGHT. As regards the influence of foot-ball on the weight of the players, a most decided increase has been noticed. The average increase in weight which was observed and calculated from seventeen players, examined in the fall of 1892, immediately before and after the period of training, with regard to this point, was found to be 3.6 kilos, or 7.9 pounds. The same observations being repeated on twenty-five players in the fall of 1893, resulted in showing an average increase of 3.28 kilos, or 7.2 pounds.

Expressed in percentage, the average increase of the seventeen players examined in 1892 was 4.9 per cent. of their original weight, and in 1893, in the twenty-five players under observation, it amounted to 4.7 per cent. of their original weight, as the "weight" column of Table II. will show.

TABLE II.—INFLUENCE OF TWO MONTHS' EXERCISE AT FOOT-BALL ON THE WEIGHT AND LUNG-CAPACITY OF 25 PLAYERS.

Observations in October and November, 1893.

No.	Age.	Height.	L. cap. i.	L. cap. ii.	Gain.	Weight, i.	Weight, ii.	Gain.
	Yrs. mos.	Mm.	Litres.	Litres.		Kilo.	Kilo.	Kilo.
1	19 6	1740	4.58	4.75	...	70	72	2
2	19 10	1832	5.73	6.22	...	75	80	5
3	21 6	1780	4.07	4.26	...	70	75	5
4	21 0	1812	4.26	4.34	...	65	64	—1
5	19 0	1738	4.45	4.45	...	70	70	0
6	21 3	1688	4.26	4.45	...	65	67	2
7	17 8	1690	4.45	4.50	...	71	71	0
8	20 3	1673	3.94	4.07	...	59	62	3
9	21 3	1696	4.26	4.45	...	62	66	4
10	20 0	1740	4.45	4.45	...	70	76	6
11	19 2	1730	4.26	4.45	...	64	70	6
12	18 1	1828	3.94	4.26	...	71	73	2
13	19 9	1752	3.94	4.07	...	76	80	4
14	19 9	1780	4.50	4.91	...	67	70	3
15	19 6	1802	4.58	5.07	...	75	80	5
16	17 9	1754	4.07	4.26	...	75	80	5
17	22 0	1690	5.57	5.73	...	76	80	4
18	21 1	1805	5.32	5.57	...	67	70	3
19	21 10	1780	4.91	4.91	0	70	75	5
20	19 6	1730	5.57	5.90	...	74	80	6
21	18 1	1858	4.58	4.91	...	69	73	4
22	20 6	1762	3.76	4.45	...	73	75	2
23	17 6	1781	4.07	4.45	...	74	76	2
24	22 4	1828	4.58	4.58	0	68	70	2
25	20 2	1720	4.07	4.45	...	67	70	3
Av. (French)	19 11	1758	4.53	4.71	0.18	69.72	73	3.28
Av. (English)	19 11	69.2 in.	277 cb.in.	288 cb.in.	11 c. i.	153.3 lbs.	161 lbs.	7.7 lbs.

3. LUNG-CAPACITY. There is perhaps not one single subject in connection with physical training upon which more stress is laid by the more experienced men in this field than the necessity of developing the lung-capacity. The capability of drawing a sufficient amount of oxygen into the system to supply at all times, and under all conditions and circumstances, the amount necessary for the full performance of the various functions of all the living cells in the system must ever be looked upon as a condition *sine qua non* to be aimed at by the physical trainer. The amount of oxygen that an individual is capable of absorbing into his system being largely dependent on the amount of air he will be capable of inhaling in a given time, or in one inspiration, we naturally turn to his lung-capacity, as ascertained by the spirometer, for points regarding his enduring qualities.

On October 15, 1892, the first examination of seventeen players was

made with regard to their lung-capacities, and at the end of November the second examination was made. The result of these two examinations was quite surprising, for all the men, except two, came back with the same lung-capacity on their second examination that they had shown on their first. The only increase that had taken place was noted in two half-backs—who, as is well known, have to do a great deal of running during the game. Thinking that it was possible that the lung-capacity increased in the beginning of the period of training, and that I ought to have taken my first observations on the 1st instead of on the 15th of October, the same observations were repeated this year (1893) on twenty-five players. The results are likewise shown in Table II., where it will be seen that the twenty-five players, after a two months' course of training on the foot-ball field, give us an increase in lung-capacity of eleven cubic inches, or an average increase of 3.9 per cent. of their original lung-capacity. Notice, however, that the percentage amount of increase in weight is 0.8 higher than that of the lung-capacity, a circumstance of some weight in its relation to the subject of "vital index," or the result of a simple division of lung-capacity by weight, and to which we shall again refer later on.

4. TOTAL STRENGTH. According to the *Anthropometric Manual* of Amherst College, published in 1893, by Drs. E. Hitchcock and H. H. Seelye, the tests to be taken of a person whose total strength is to be calculated are as follows:

a. Expiratory strength. The subject, after loosening the clothing about the chest and filling the lungs completely, should blow with one blast into the spirometer. Care should be taken that no air is allowed to escape from the sides of the mouth, and that in expelling the air all the muscles of expiration are brought into play.

b. Strength of back. The subject standing upon the foot-rest—as shown in Fig. 1, but with the legs straight—and with the dynamometer so arranged that when grasping the handles with both hands his body will be inclined forward at an angle of 60°, should take a full breath, and, without bending his knees, give one hard lift, mostly with his back.

c. Strength of legs. The subject, while standing on the foot-rest, with body and head erect, and chest thrown forward (see Fig. 1), should sink down by bending the knees, until the handle grasped rests against the thighs, then, taking a full breath, he should lift hard, principally with the legs, using the hands to hold the handle in place.

d. Strength of upper arms (triceps). The subject, while holding the position of rest upon the parallel bars (see Fig. 2), supporting his weight with arms straight, should let the body down until the chin is level with the bars, and then push it up again until the arms are fully extended. Note the number of times that he can lift himself in this manner.

e. Strength of upper arms (biceps). The subject should grasp a horizontal bar or pair of rings, and hang with the feet clear from the floor,

FIG. 1.[1]

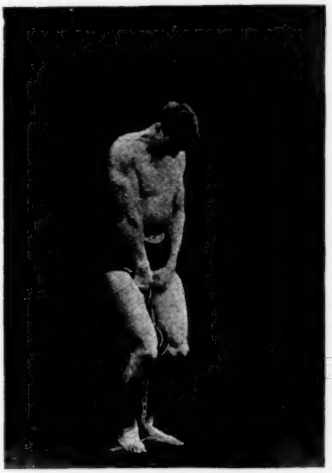


FIG. 2.

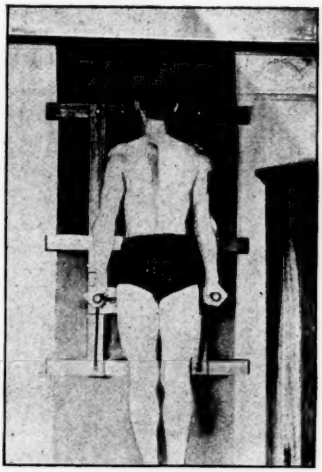
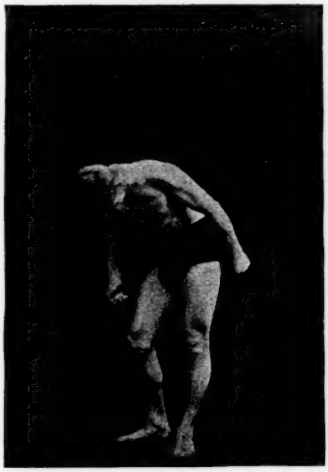


FIG. 3.

FIG. 4.



while the arms are extended. Note the number of times that he can haul himself up until his chin touches the bar or rings. (See Fig. 3.)

[1] These illustrations are used by permission from *Physical Education*.

f. Strength of forearms. (See Fig. 4.) The subject, while holding the dynamometer so that the dial is turned inward, should squeeze the spring as hard as possible, first with the right hand, then with the left.

The total strength is obtained by multiplying the weight of the subject by the sum of the "dip," *d*, and the "pull," *e*. (This is divided by 10 simply to prevent too great a number of figures in the calculation.) To this is added the strength of back, the strength of legs, the average of the forearms, and the lung-strength, *a*. The sum is the "total strength."

For example: The weight of the subject being 64 kilos, the "dip" 11, and the "pull" 12 = 23; the back-strength 150, and the leg-strength 180, the forearm-strength 45, and the lung-strength 2, the result will be $64 \times 23 \div 10 + 150 + 180 + 45 + 2 = 524$.

This method, as will be noticed, is not intended to give us the exact amount of work that an individual is capable of doing, and which is calculated after a different manner,[1] but rather the total amount of available energy or strength which a person may bring to bear upon an obstacle at any given moment; in other words, it leaves us for the moment in ignorance as regards the endurance.

TABLE III.—INFLUENCE OF FOOT-BALL PRACTICE ON THE TOTAL STRENGTH OF THE PLAYERS.

No.	17 players, av. age 19 yrs. 6 mos. av. height 1765 c.m. or 69.5 in. Observation in 1892.			15 players, av. age 20 yrs. 3 mos. av. height 1763 c m. or 69.4 in. Observation in 1893.		
	Total strength in kilos.			Total strength in kilos.		
	First exam.	Second exam.	Gain.	First exam.	Second exam.	Gain.
1	648	689	41	572	616	44
2	758	801	43	567	616	49
3	654	703	49	598	685	87
4	621	672	51	785	793	8
5	648	700	52	478	580	102
6	746	832	86	525	686	161
7	521	608	87	724	815	91
8	692	790	98	590	709	119
9	543	649	106	718	780	62
10	753	860	107	631	724	93
11	500	612	112	515	611	96
12	852	974	122	604	686	82
13	500	630	130	666	696	30
14	504	635	131	420	588	168
15	664	836	172	565	648	83
16	692	884	192			
17	626	824	196			
Averages	642	747	105	597	682	85

Table III. exhibits the observations of the last two years and their results. The average increase in total strength of the seventeen players examined in the fall of 1892 was 105 kilos, or about 16.4 per cent.

[1] See Report of the Surgeon-General of the Navy, 1893, p. 150.

of their original strength, and that of the fifteen players noted in the fall of 1893 amounted to 85 kilos, or 14.2 per cent. of their original strength. On examining more closely into the distribution of this increase in strength we have found that about 75 per cent. of it extends over the lower extremities and the back, showing that, although all the muscles are engaged in playing the game, there is a quantitative difference of degree.

In the beginning of the last foot-ball season I examined about forty players with the view of getting a larger number for the second examination. But—as a glance at the number of tests that must necessarily be taken of each individual, in order to accurately calculate from the facts thus ascertained his total strength, will show—the individual must be in perfect condition at the time of examination. Bruised hips, knees, ankles, shoulder-joints, elbow- or wrist-joints, and even finger-joints, will make accurate tests impossible; and hence the larger number of them—some of the best among them—could not be examined a second time immediately after the close of the season, and had to be thrown out of our observations to make the remaining ones as nearly accurate as is possible under the circumstances. Here is another reason why it is so difficult to obtain large numbers of observations in this field, and which also may largely account for the fact that no observations of this nature made at some of the other colleges of the United States have, at least up to the present, come to my notice.

Attention has already been called to the "vital index" (Enebuske) as having a certain significance in relation to the results obtained by physical training. The vital index is obtained by dividing the lung-capacity of a person as ascertained by means of the spirometer, and expressed in litres, by his weight in kilos. Démény, in France, from his studies on children, found that in those of the same age the lung-capacity was proportioned to their weight, and that if a curve were constructed of lung-capacity and weight in relation to age, the two curves come out parallel.

Démény found, furthermore, that this ratio was much higher in persons having undergone systematic physical training than in those who had not. These studies of Démény have been repeated in a measure by Enebuske, and their correctness in his hands appears to have received additional support. Démény, quoted by Enebuske,[1] makes this statement regarding the index: "By taking young gymnasts and arranging them according to the decreasing value of their ratio of lung-capacity and weight, we have been able to ascertain that thereby we have made a classification that corresponds sensibly to their degree of resistance."

[1] Observations on the Results of Pedagog-Gymnastics of the Ling System, made at the Boston Normal School of Gymnastics, Boston, 1893.

From our own limited experience with this index we believe it will be found correct for the large majority of cases.

Before leaving the subject of total strength, I must add what appears to me to be a point of considerable interest. It might quite naturally occur to the reader that this so rapidly acquired strength was but a temporary affair, and would vanish again as quickly as it was acquired. As I was myself under this impression, I searched my records, and found that I was somewhat mistaken. In the seventeen players of last fall (1892) the maximum loss six months after the close of the season was only 5 kilos, or less than 1 per cent. Thus, no matter what we may find with regard to the staying qualities of the strength acquired through other sports, foot-ball strength, according to these observations, seems to stay pretty well.

SUMMARY.—In summing up the facts ascertained in the above observations, we obtain as a result of two months' foot-ball training on the seventeen players examined in the fall of 1892: (1) No increase in height, (2) no increase in lung-capacity, (3) an average increase of 4.9 per cent. in weight, and (4) an average increase of 16.4 per cent. in total strength. In the twenty-five players examined in the fall of 1893 we get: No increase in height, an average increase of 4.7 per cent. in weight, an average increase of 3.9 per cent. in lung-capacity, and an average increase of 14.2 per cent. in total strength (17). In both series of observations we have to record a decrease in vital index.

It now becomes clear that in order to form any proper conception as to whether foot-ball is an exercise superior, inferior, or equal to any other form of exercise, we would require a similar set of observations made on the devotees of base-ball, cricket, lawn-tennis, boating, or any other out-of-door exercise, for the purpose of making comparisons. In this respect, however, the literature on physical training is sadly and most painfully deficient; there are, among the large number of books written on the subject, no published accounts with which to make such comparisons. The most we can do at present, therefore, is to form an approximate idea deduced from a comparison of these results with those obtained in the gymnasium. But even here we meet with almost the same scarcity of published results, and thus we cannot escape coming to the conclusion that the much-vaunted benefits derived from athletic as well as gymnastic exercise, *for all we know or can get at*, exist for the most part in the minds of physical trainers, and perhaps in the personal feelings of those who have taken such exercises. Although this may form quite sufficient evidence for some, it will nevertheless not do for the purpose of establishing an incontrovertible fact, as it ought to be established, on sufficient scientific grounds. Science, unfortunately for some, requires proof; opinions may content themselves with faith.

But, the paucity of scientific data to the contrary notwithstanding, we all have at least a very strong suspicion that all forms of exercise, especially the out-of-door ones, do produce good results, not only with regard to their influence on the physique, but also on the mind, the discussion of which, however, from the nature of this inquiry, does not come within the scope of our paper.

In some studies made on fifty naval cadets, and published in the report of the Surgeon-General of the Navy for 1893, the following average increases were noted as a result of six months' systematized exercise in the gymnasium, viz.: 0.5 per cent. in height, 1.3 per cent. in weight, 3.8 per cent. in lung-capacity, and 32 per cent. in total strength. The average vital index at the beginning was 0.067 and at the end of the term 0.066, consequently there was a slight decrease. The average age of the fifty cadets was exactly eighteen years.

According to the measurements in our possession of eight oarsmen, including about two months' hard training for a boat-race during the spring months of 1893, we are enabled to record the following average increases, viz.: 0.2 per cent. in height, 4.7 per cent. in weight, 7.3 per cent. in lung-capacity, and 28 per cent. in total strength. The vital index at the beginning of the period of hard training was 0.066 and at the end it was found to be 0.068; there was, therefore, a slight increase in the latter.

These several items are arranged in the following table:

TABLE IV.

Results of training in	Average Age.	Height.	Weight.	Lung capacity	Total strength	No. of obser.	Time.
	Yrs. mos.	Per ct.	Per ct.	Per ct.	Per ct.		
1. Foot-ball, 1892	19 6	0	4.9	0	16.4	17	2 months.
2. Foot-ball, 1893	19 11	0	4.7	3.9	14.2	25	2 months.
3. Oarsmen, 1893	19 3	0.2	4.7	7.3	28	8	2 months.
4. Cadets, gym., 1892–3	18 0	0.5	1.3	3.8	32	50	6 months.
5. Cadets, gym., 1893–4	18 0	0.8	1.0	6.5	25.0	74	6 months.

The several methods of training for these sporting events, as well as the system of exercises in the gymnasium pursued nowadays, being so well known, and described elsewhere, a description of them may here be omitted.

The figures shown in Table IV., so far as they may be of value, would lead one to conclude that both the regular systematized gymnasium drill and boating would furnish results superior to those of foot-ball. Boating, considering the large percentage of increase in lung-capacity and total strength which it here shows, must be considered the best training of them all.

Moreover, if we compare the vital index of our average foot-ball player as he appears in Table I., and which is 0.059, with the average vital index of the fifty cadets, which is 0.066, and that of the oarsmen, which is 0.068, the same of the average Yale student being 0.065 and of the average Amherst student 0.061, we find it rather below all of them.

These are the simple unqualified *facts* as to foot-ball. Having now arrived at where we may form at least an approximately true conception of what the results of certain methods of training and exercising are, we must turn our attention to another very important question, and one not to be lost sight of in an inquiry of this character, viz.: Are all the finely-developed young men whom we see in the field at one of our championship games really the result pure and simple of foot-ball play, as is commonly inferred, or might it not also be possible that some of the fine manly qualities which they exhibit have been handed down to them from some not too remote ancestor? In other words, has the foot-ball field exercised a certain *natural selection* in the choice of its devotees, to complement that of the "coach," or are our fine athletic players indeed creations *de novo* of the foot-ball field alone? And this question must be asked with regard not only to foot-ball but also to all our athletic sports. It so happens that it is, comparatively speaking, much easier to prove that natural selection has by far the biggest share in the furnishing of the foot-ball field with its men; its influence in this instance is, indeed, so apparent and so strongly marked that even without the assistance of craniometric data, the anthropological eye may easily discern an overwhelming preponderance of Anglo-Saxon and Germanic types of men, exhibiting to a large extent the good and characteristic qualities, mental and physical, of their blue-eyed, light-haired, and long-headed ancient ancestry. But we need not alone rely on what we merely see with our eyes, for we have in our possession an abundance of material to show that the sport attracts superior types of men from the very start.

To begin with, let us, for instance, first compare the records of our own foot-ball men with those of the fifty percentile grade cadet, confining ourselves in making such comparison to the same items that have formed the bases of all our previous observations, namely, height, weight, lung-capacity, and total strength.

As shown in Table V.: (1) The average age of the thirty six foot-ball players is but two months ahead of that of the fifty percentile grade cadet, and represents, therefore, the average cadet so far as age is concerned, in accordance with the fact that players are admitted from all the four classes alike; (2) in height we find the foot-ball-player in average 4 per cent. superior; (3) in weight he is 28 per cent. superior; (4) in lung-capacity 21 per cent., and (5) in total strength 49 per cent. superior to his average fellow.

TABLE V.

	Av. age.	Height.	Weight.	Lung cap.	Tot. str.	No. obs.
	Yrs. mos.					
Fifty percentile cadet . .	19 7	1697	57	3.58	454	603
Average foot-ball player . .	19 9	1766	73	4.66	676	36
Superiority in per cent.	.....	4	28	21	49	

In the thirty-six players here represented, and of which number alone complete measurements were available for our purpose, there are included but eleven championship players, the remaining ones are those who never will play in a big game and, consequently, fall below the average; besides, nearly all the measurements represent the player as he is at the beginning of the training period, and without the increase noted to take place from the course of training.

But if even we were to take off from this, the percentage superiority, that which we have shown may be gained during a two-months' course of training at foot-ball, it would scarcely perceptibly lessen the former nor tend to make the conclusion less convincing that natural selection is by far the strongest of the two factors in the production of our finely-developed-looking foot-ball devotees.

Nor need we confine our comparisons to the records of the Naval Academy alone, for there is an abundance of material for comparison on hand outside of it.

Let us take, as another instance, the figures of our average American foot-ball man, as shown in Table I., and compare him with the fifty percentile grade of the Yale students, from tables published by Seaver, and compiled from measurements taken during a period of five years.

TABLE VI.

	Av. age.	Height.	Weight.	Lung cap.	Tot. str.	No. obs.
	Yrs. mos.					
Av. American foot-ball player .	20 8	1773	76	4.55	602	77
Yale student, 50 per cent. . .	19 7	1724	63.1	4.13	458[1]	(5 years)
Superiority in per cent. .	.....	2.8	20	10	44	

We find by a glance at Table VI. that the average American foot-ball player is (1) one year and one month older, (2) 2.8 per cent. taller, (3) 20 per cent. heavier, (4) has 10 per cent. more lung-capacity, and

[1] Computed from insufficient data, but believed to be approximately correct.—H. G. B.

(5) is 40 per cent. stronger than the fifty percentile grade of Yale students.

Making, finally, a similar comparison with the Amherst student of the fifty percentile grade, and using for this purpose the tables but recently published by Drs. Hitchcock and Seelye, we will find, by examining Table VII., a superiority existing similar to that already noticed in previous tables.

TABLE VII.

	Av. age.	Height.	Weight.	Lung cap.	Tot. str.	No. obs.
	Yrs. mos.					
Av. American foot-ball player .	20 8	1773	76	4.55	662	77
Amherst student, 50 per cent. .	22 6	1720	61.7	3.77	482	2230
Superiority in per cent. .	.....	3	23	20	37	

This selective influence is not only shown in the larger boys, but extends, it would seem, also into smaller communities of boys. There are two sets of boys here who have banded themselves together into foot-ball "teams," and if anyone should think that they do not play the regular game in dead earnest, he may come and pay us a visit during the season and investigate for himself.

The smaller team, which we may, for convenience sake, call juvenile team No. 1, consists of boys of an average age of eight years; and on comparing their average height with that of the fifty percentile grade of the Boston school boys[1]—of the same, age of course—we find it to be 6 per cent. superior to that of the latter, and in weight they are 3 per cent. superior.

Juvenile team No. 2 consists of boys of an average age of thirteen; their measurements show, on a similar comparison being made, a superiority to the Boston school boys of 3 per cent. in height and 6 per cent. in weight.

We have seen the statement made somewhere that the class-standing of those of the college students who devote themselves to athletic sports is higher than that of those who do not, and the inference is, that the practice of those sports leads directly up to this result. We do not doubt for a moment the absolute correctness of the statement, but the inference may have to be slightly modified, for in view of the above facts we must likewise admit, at least, the possibility of an influence of the principle of selection; this influence admitted, we would rather expect to find what is implied in the above statement as a natural coincidence, than try to explain it on other grounds. We do not doubt in

[1] H. P. Bowditch: Growth of Children, etc., Boston, 1891.

the least that bodily exercise influences the functions of the brain most favorably, but it does this indirectly, for, in order to produce any measurable changes in the quantity and quality of brain work, its influence would have to be much more profound than it is, and be continued for many generations, for the results of thousands of years of Nature's work on mankind are not so easily influenced as to be educated away by an afternoon's practice at foot-ball.

What, now, it may be asked, have we learned from these observations? Do they prove that gymnastic exercise is a mere fad, and that foot-ball is worthless? They do neither; but on the contrary, if they prove anything, they plainly show that, if we have placed our foot-ball ideal unadorned on the balance, we have not found it wanting; and while it cannot be considered the best game in the world, and much of its vaunted superiority is due to popular clamor conjured up by the newspapers, it must, nevertheless, be considered as *one* of the best games extant. Based on these observations, we may feel ourselves on much firmer ground than we did before, if even we have to limit our arguments to the point of physical training alone, and cannot, from the nature of our inquiries extend our conclusions to the other manifold beneficial results produced by the game, the investigation of which must be relegated to the psychologist.

On the other hand, if physical training is to stand, do not let us base our conclusions on false premises, for unless we take care that our grounds are true, broad, and deep, a sudden wave of popular indignation may some day cause it to come to a premature end, or, to say the least, seriously impede its onward march!

The question of policy regarding foot-ball, and as to how it should be played and managed in the future, has been so ably discussed by Drs. White, Wood, and Roosa, as well as Presidents Schurman, Angell, and Warfield, that there remains but little to be added to it here.

The greatest danger that threatens foot-ball, by unanimous consent, seems to be the introduction of the professional element into its constitution. This, again, must be looked upon as the direct consequence of newspaper clamor.

Unless, therefore, our college faculties will get together and arrange a special selective course leading up to the degree of Bachelor of Athletics, thus dignifying the game at once as a profession, which, I fear, they are not yet prepared to do, we will have to use a certain amount of discrimination and play foot-ball with more moderation, confine the game to the undergraduates and to the college-campus if it is to continue to live.

But how about the number of injuries and even deaths that have been recorded as having been produced on the foot-ball field? While it must be admitted that accidents may occur here as elsewhere, and in

spite of all proper precautions having been taken, it is, nevertheless, probably also true that, were all the circumstances surrounding these cases known, all the recorded deaths, without an exception, would be found traceable to gross carelessness of one kind or another. At any rate, since we cannot eat our pie and have it too, we shall have to pay a certain amount for the good we derive from it; and, if we should find that our investment does not turn out a gold mine, we may be satisfied with a silver one. But, certainly, all the injuries produced on the foot-ball field, in games played between gentlemanly and well-matched players, that have come under our observation have been amenable to treatment and have resulted in perfect cure.

The one precaution mentioned by President Warfield, viz., to make the medical director in charge of physical training omnipotent in excluding boys who are unfit to play in this game by reason of certain physical conditions or injuries existing, cannot be too strongly urged upon college faculties and those who wish to see the game survive.

REVIEWS.

THE NATIONAL DISPENSATORY: containing the Natural History, Chemistry, Pharmacy, Actions, and Uses of Remedies. By ALFRED STILLÉ, M.D., LL.D., Professor Emeritus of the Theory and Practice of Medicine and of Clinical Medicine in the University of Pennsylvania; JOHN M. MAISCH, Phar.D., late Professor of Materia Medica and Botany in the Philadelphia College of Pharmacy; CHARLES CASPARI, JR., Ph.G., Professor of Theoretical and Practical Pharmacy in the Maryland College of Pharmacy; and HENRY C. C. MAISCH, Ph.G., Ph.D. Fifth edition, with three hundred and twenty illustrations. Pp. viii., 1903. Philadelphia: Lea Brothers & Co., 1894.

THE enormous strides which mark the advance of the knowledge of the natural history, chemistry, pharmacy, actions and uses of medicines are never so strongly impressed upon the physician as they are at the time he carefully reviews a book of this magnitude. Especially when one considers that the sweeping and radical changes which have been introduced into the last edition of the United States Pharmacopœia have necessitated an entire re-writing of the descriptive portions of the work does he realize how greatly the fifth differs from the fourth edition. And when it is taken into consideration that the past few years have been years of unprecedented activity on the part of botanists, chemists, and therapeutists—not only in the production and testing of an enormous number of new drugs, but also in the verification of the facts supposed to be established about the older ones and in extension of the field of employment of those well understood—we can well appreciate the fact that this, as compared with the last edition, is practically a new book, and as compared with the first edition, which, as a student, we read fifteen years ago, it is an encyclopædia contrasted with a text-book. The various editions have all borne the impress of the ripe scholarship and practical experience of Stillé on the therapeutical and clinical side, the accurate learning and broad botanical and pharmaceutical knowledge of Maisch—ably supplemented, in the last, by Caspari, Jr. Not content with our own Pharmacopœia alone, which in its last edition is creditable to the best pharmaceutical and therapeutical knowledge which obtains in this country, the editors have frequently broadened the scope of the work by references to the British and German Pharmacopœias and to the French Codex.

The *Dispensatory* proper occupies seventeen hundred and thirty-seven clearly and cleanly printed pages—practically a combined chemistry, botany, pharmacy, materia medica, pharmacology, and therapeutics, for the pharmacist and physician. Omissions are few in number. Cocillana, which has a good present with the prospect of a substantial future, certainly deserved mention. Asaprol does not receive

due attention, in that the later work of Dujardin-Beaumetz and others is not reported. Oleum betulæ volatile, a preparation of the last edition of the Pharmacopœia, is entitled to have a heading of its own, in its proper place amongst the olea, and should not be a sub-head under oleum gaultheriæ. Very rarely does one find typographical errors: page 1310, $3K_2MNO_4$ is found instead of $3K_2MnO_4$; chlorodine appears in the index, instead of chlorodyne; euphorin is europhin in the index, thus making the usual confusion with europhen much more likely.

The Appendix covers fifty-two pages and treats of Reagents and Tests; Volumetric Assays; Saturation Equivalents of Acids; Alkali and Acid Percentages of Salts; Table of Elements; Formulas and Molecular Weights of the Principal Chemicals and Reagents; Equivalents of Weights and Measures; Tables of Weights and Measures; of the Relation by Degrees of Baumé's Hydrometer to Specific Gravities, and of Thermometric Equivalents; and an alphabetical List of Official Drugs in the United States and British Pharmacopœias and the preparations containing them.

The General Index (to botany, materia medica, chemistry, and pharmacy) covers seventy-six three-columned pages; the Index of Therapeutics occupies the remainder of the volume—thirty-six pages. The thoroughness of the indexing may be appreciated when it is stated that there are twenty-five thousand references. Minor advantages, as the full list of synonyms, large numbers of chemical formulæ, temperatures given both in Centigrade and Fahrenheit, weights and measures in both metrical and apothecaries' systems, and references to current periodical literature, are best appreciated by the teacher and author, but are as well useful to the practising physician and the pharmacist. The best test of the accuracy and usefulness of a book is to be found in its availability in solving the questions that arise each day. During the past four months this volume has been in constant use, and very rarely has its information been found to be incomplete or inaccurate.

Not only has the editorial work been excellently done, but the mechanical making is of the best; the book is made to be used, and it is likely to be in constant requisition. In comparison with similar works of foreign origin, we feel that it will not suffer, but that it will stand on its merits as a monument to the persistent industry, broad information, scientific investigation, and scholarly attainments of the authors.

R. W. W.

AN AMERICAN TEXT-BOOK OF THE DISEASES OF CHILDREN, BY AMERICAN TEACHERS. Edited by LOUIS STARR, M.D. Pp. 1148. Philadelphia: W. B. Saunders, 1894.

THE first chapter of this excellent book—"Clinical Investigation of Disease and Management of Children," by Dr. Louis Starr—is a clean bit of work, which affords good evidence of the editor's ability to illustrate the art of "condensation without omission," which he announces in his preface as an essential condition in the making of a successful text-book.

Among the divisions of this first chapter, "Feeding" may be cited as an example of sound and rational treatment of a subject which has been much overwritten hitherto. It is pleasant to find the opinion regarding

the employment of wet nurses which most of us have been driven to adopt, indorsed by such good authority, and that he considers it preferable in a majority of cases to trust to careful bottle-feeding. All essential facts are clearly stated in his directions for artificial feeding, and it is evident that the author's experience has proved that few hard-and-fast rules can maintain in all cases; that the lacteal secretion of the cow alone (no matter how artfully mixed, diluted, and sterilized) will not nourish every baby; that *nascitur non fit* applies occasionally to infant dyspepsias as well as to poets. The directions given for sleep, baths, clothing, and exercise are admirable.

"Tuberculosis," by Dr. Osler, gives a thorough and well-defined description of the various forms of disease which the infection causes in children; and while the entire paper is most readable, that portion relating to pulmonary tuberculosis from a clinical standpoint is especially good. The fact that a broncho-pneumonia (either in the form of an acute suffocative bronchitis, or the commoner type) is frequently merely a death-mask assumed by tubercle, is very clearly brought out, and the difficulties of diagnosis under these conditions are emphasized, while the rarity (in this country at least) of a pulmonary tuberculosis simulating a frank pneumonia receives due mention. In Dr. Osler's opinion, the estimate that 10 to 15 per cent. of the dairy stock in the Eastern States is tuberculous is probably a low one.

The eruptive diseases are all well done, and none of them overdone—the chapter on "Scarlet Fever," by Dr. Marcus P. Hatfield, being particularly good. How much is gained by the insertion in this or any other medical work of colored plates is a question which each reader must answer for himself. In regard to the quarantine which should be enforced in cases of measles, Dr. Starr, in recommending a period of three weeks, differs from some other authorities, who do not hesitate to allow children who have been isolated to return to the common wards a fortnight from the date of the appearance of the eruption.

"Asiatic Cholera," by Dr. Edward O. Shakespeare, and "Diphtheria," by Dr. Dillon Brown, may be cited as two of many practical and thoroughly modern papers which this book contains. The latter, when taken in connection with the chapters on "Intubation and Tracheotomy," by Dr. Henry R. Wharton, satisfactorily disposes of membranous deposits in the air-passages, whether caused by the Loeffler bacillus or not. It is to be regretted that Dr. J. Madison Taylor, in his excellent chapter on "Exercise and Massage," does not devote a little space to the effects of bicycling on the growing spinal column. It would be interesting to learn whether, in the opinion of one who had made a special investigation of the subject, the growing generation will walk erect in God's image or permanently bow to the influence of this popular sport. A word or two from so good an authority as to the effects upon the figure of the "scorcher" attitudes assumed by most of the lively young people who are rapidly depriving their elders of all rights in public thoroughfares would be most timely.

"Injuries and Diseases of the Newborn," by Dr. Edward P. Davis, is a carefully considered and thoroughly well-written paper which is of interest alike to the pædiatrist and accoucheur.

Dr. Henry D. Chapin has contributed a first-rate article upon "Hereditary Syphilis." It contains a clear and concise description of the disease, but in regard to the treatment which he recommends there

is certainly room for difference of opinion. In speaking of mercurial inunction, Dr. Chapin says: "It is probable, however, that it will be found, as a rule, more satisfactory to employ internal medication." In contrast with this, one or two of the axioms of the highest living authority are worth quoting: "You cannot salivate without teeth;" "Very young infants bear mercury internally only in doses sufficient to allow them to die;" and "*Leur salut est dans les frictions.*"

"Whooping-cough," by Dr. J. P. Crozer Griffith, is a most satisfactory chapter. The only criticism to which it is open is that the belladonna treatment is not described sufficiently in detail. We think it should be impressed clearly upon the mind of the reader that it is only by keeping the patient under careful supervision and giving the drug in doses sufficient to insure the almost constant presence of one or more of its physiological symptoms *for two or three days* that the best results are obtained in obstinate cases. Used in this way it rarely disappoints. Prescribed in insufficient doses it is no more of a specific than a dozen other drugs which are merely placebos to satisfy the minds of the attendants while the cough takes care of itself.

In an able and conservative paper, Dr. J. Lewis Smith offers what appears to be the only rational explanation of the frequent occurrence of rhachitis in children whose surroundings are good, but who are fed exclusively upon proprietary foods. The element which is lacking, as clearly shown by the careful analysis of Prof. Albert R. Leeds (in his admirable contribution, "The Chemistry of Milk and Artificial Foods for Children") is fat. After a brief consideration of the claims made by the advocates of phosphorus, he arrives at the conclusion that while combining this drug with cod-liver oil does no harm, the latter must remain our sheet-anchor so far as internal treatment is concerned.

In Dr. J. M. Da Costa's article on "Rheumatism" we have just what might be expected from the pen of so eminent an authority and wise observer. He notices the intimate relations between the disease in question and certains forms of pleurisy which is so strongly insisted upon by the best French practitioners. Regarding the salicylate treatment, his opinion that it should be discontinued if good results are not speedily obtained will be indorsed by many of us who have persisted only to meet with disappointment, if nothing worse. His recommendation that the full dose be used at the outset, and then diminished, is a point of great practical importance, while his expressed conviction from experience that the salicylates neither prevent nor benefit cardiac complications must furnish food for reflection.

"Diseases of the Mouth," by Dr. Frederick Forchheimer, is well worth reading. That portion which is devoted to dentition deserves special attention, as in addition to an admirably clear description of the process of teething, the author attacks the gum-lancet with much vigor and originality. The conclusions which he arrives at as the net result of an apparently flawless argument are: 1. "Gum-lancing is useless: (*a*) so far as giving relief to symptoms; (*b*) so far as facilitating or hastening teething. 2. It is useful only as a bloodletting or as a suggestion, and ought not to be used as such. 3. It is harmful: (*a*) in producing local trouble; (*b*) in producing great disturbance on account of hemorrhage; (*c*) in having established a method which is too general for specific good and too specific for universal use. 4. It is to be used only as a surgical procedure to give relief for surgical accidents." Nothing

which we could say in the way of comment on the above could possibly go straighter to the point than the editor's note which appears at the end of the chapter: "The author certainly presents in a very forcible manner one side of the disputed question of the advisability of gum-lancing. That too many aberrations from health are laid to the score of teething, and that lancing is often performed heedlessly, unnecessarily, and even injuriously, cannot be questioned, yet there are many well-informed physicians and clinicians who use the lance in appropriate cases, because experience—the crucial test—has demonstrated its utility. In this class the editor must be included."

"Diarrhœal Diseases," by Dr. Victor C. Vaughan, deserves more than passing notice. Following his statement that "the gravest symptoms in the most speedily fatal cases are often accompanied by the most superficial lesions, while on the other hand symptoms so mild that no anxiety is awakened may result from marked and extensive pathological changes," and that "it would be as unscientific to attempt a classification of the diarrhœas of infancy founded upon pathological anatomy as it would be to designate acute, subacute, and chronic arsenical poisoning as desquamative, catarrhal, and ulcerative gastro-enteritis," he gives us a classification based upon the etiology of the various forms of diarrhœa which certainly seems a practical working scheme from a clinical standpoint.

Briefly stated it comprises: (1) Acute and chronic intestinal indigestion (from excessive or improper feeding), which do not differ essentially from similar conditions as observed in adults, and are comparatively independent of seasonal influence; (2) acute and subacute "*Milk-infection*," which correspond to cholera infantum and gastro-enteritis in ordinary nomenclature. This is assuredly a most practical and ingenious method of solving a vexatious problem, and good results will follow a general adoption of the term "milk-infection" in the shape of increased vigilance in guarding milk supplies from contamination. The name well defines the gastro-intestinal troubles of very young children in hot weather, and at the same time proclaims the *fons et origo* of infantile mortality during the summer months. We readily credit the writer's statement that he has not been led to adopt a new nomenclature for the sake of introducing a novelty, and congratulate him upon his happy thought.

"Gastric Catarrh and Gastric Ulcer," by Dr. A. D. Blackader, of Montreal; "Dysentery," by Dr. Samuel S. Adams, and "Diseases of the Liver," by Dr. John H. Musser, are thoroughly satisfactory examples of many excellent papers which this work contains, and in which the authors have confined themselves to such facts and theories as are necessary to a good comprehension of the subjects they write of, and avoid any undue emphasis of personal opinions. A vast majority of the contributors have practised self-effacement rather than assume any risk of impairing the value of this admirable text-book, and when we consider the *personnel* of the corps we cannot but admire their modesty and honesty of purpose in restricting themselves to what certainly must have seemed *to them* dry bones indeed.

The leading facts concerning "Intestinal Parasites" are well stated by Dr. Charles W. Townsend. Oil of male-fern and pelletierine are justly recommended as the most efficient remedies for tapeworm, and very little space is wasted in enumerating the drugs which, in spite of their reputation as tæniacides, almost invariably fail to remove the head.

It is a pleasure to read so good a description of "Mucous Disease" as that written by Dr. William A. Edwards. Notwithstanding the fact that the pathology of the trouble (has it a special pathology?) remains obscure; it is a condition which forces recognition as differing essentially from the membranous enteritis of adults, and no one can afford to ignore it. The treatment is satisfactorily described; we agree with the writer in his expressed belief that intestinal asepsis to a beneficial degree may be obtained by the use of internal remedies, which he recommends.

Dr. William Perry Northrup embodies in his chapter on "Scorbutus" much valuable information concerning a disease which we never before have associated with children of American birth and parentage. Among his cases he cites one of a typical scurvy in a child whose surroundings were all that wealth can provide. The most frequent direct cause in his opinion is prolonged feeding with proprietary foods and canned milk. Here again it will be observed that the question of an insufficient supply of fat comes up just as it does in the causation of rhachitis. What with 15 per cent. or more of our Eastern cows tuberculous, and proprietary foods lacking in an essential element of nutrition, the American infant is indeed caught between the devil and the deep sea.

"Tubercular Meningitis," by Landon Carter Gray, is a first-rate paper, which in spite of its brevity, gives a comprehensive view of the disease. Its pathology is concisely and admirably described. The same remarks apply equally well to Dr. Frederick Peterson's article on "Convulsions" (a subject which as usually treated is a positive affliction to the conscientious reader), and to Dr. M. Allen Starr's "Chorea." In this last-mentioned disease it is certainly quite possible to give Fowler's solution in much larger doses than fifteen drops *ter in die* without producing any of the usually described physiological symptoms of its effects, particularly if the drug be given in an alkaline diluent—but as a well-marked peripheral neuritis of the lower extremities is very liable to follow such heroic exhibitions, the wisdom of adhering to this as a maximum dose (in accordance with Dr. Starr's recommendation) is obvious.

In a short paper on "Broncho-pneumonia" Dr. William Pepper expresses his belief that its specific cause is probably Fränkel's pneumococcus—an opinion which certainly deserves serious consideration, coming as it does from so high and experienced an authority, although differing from the conclusions arrived at by Claisse from a recent series of careful researches. The clinical aspect of the disease, as usually observed in this country, is admirably described, and it is to be regretted that the brevity of this contribution has compelled the author to omit any description of the very acute and fulminant type which is observed in overcrowded tenements and public institutions where large numbers of infants are housed in a single ward. No mention is made in this chapter of the probably infectious nature of this form of the disease, which is held as proven by Simon, Sevestre, Hutinel, and all the best authorities in Paris, where it has been carefully observed and closely studied during the past three years. "Croupous Pneumonia," by the same author, is clearly written and good in every way.

A short chapter on "Fibroid Phthisis" by Dr. Frederick C. Shattuck, is thoroughly satisfactory, as might naturally be expected. A thoroughly practical contribution on "Pleurisy," by Dr. Henry Koplik adds to the value of that portion of the book devoted to pulmonary diseases.

The symptoms and diagnosis are particularly well done. In advising against the use of iodine and blisters he is assured of the sympathy of all true friends of children.

"Bronchitis," by Dr. Walter S. Christopher, is one of the best of many admirable papers. It is thoroughly modern, and we are glad to observe that in his second paragraph he loses no time in promptly discountenancing any attempt to resurrect the corpse of capillary bronchitis—which is even at this late day occasionally spoken of as an entity—and disposes of its ghost in just three and a half lines. Broncho-adenitis—as he happily terms inflammation of the bronchial glands—he regards as probably the most important cause of recurrent bronchitis, and he indorses the view that any acute bronchitis, no matter how trifling, may lead to their enlargement. The whole article is most readable; but we must take exception to his statement that "expectorants are often of great service in the earlier stages . . . when the secretion is scanty and the râles few and dry, and the cough in consequence frequent and harassing"—not senega, surely, nor yet squills. But we are not disposed to quarrel with Dr. Christopher about the meaning he attaches to the word "expectorant," and would far rather discard the generally accepted definition than miss the reading of so good a piece of work as he has given us.

"Diseases of the Skin," by Dr. William A. Hardaway, is well written and sufficiently thorough. In speaking of the etiology of alopecia areata, he ranges himself on the side of those who regard it as a trophoneurosis in spite of Besnier's expressed conviction that he has observed instances of contagion in his wards at the St. Louis. It has been impossible to notice many of the contributions which possess as much merit as any we have mentioned.

This is far and away the best text-book of children's diseases ever published in the English language, and is certainly the one which is best adapted to American readers. We congratulate the editor upon the result of his work, and heartily commend it to the attention of every student and practitioner. F. G. M.

LES UNIVERSITÉS DES ÉTATS-UNIS ET DU CANADA. By DR. O. LAURENT, Agrégé Suppléant á l'Université de Bruxelles. 8vo. pp. 307. Bruxelles: Lamertin, 1894.

THE UNIVERSITIES OF THE UNITED STATES AND CANADA.

So much has been written in America on the medical institutions of the old world, that it is quite refreshing and pleasant to see any study of the medical institutions of the new world, especially when it is made by so distinguished a teacher as the well-known surgeon and professor in the University of Brussels. Prof. Laurent has taken advantage of an extended official journey in America to prepare this admirable volume covering the medical colleges and hospitals in New York, Philadelphia, Baltimore, Washington, Ann Arbor, Chicago, New Haven, Boston, St. Louis, San Francisco, and Canada. He has been at great pains not only to copy the statements made in official documents in connection with these schools and hospitals, but has also made observations of his

own, even of minute details; such, for instance, as commendation of the mode of bacteriological illustration at the Jefferson Medical College, when culture-tubes fixed in series on a card and properly labelled were passed around the class, or in his minute observation of the buildings and appliances of the Woman's Medical College of Philadelphia. In general he is very exact. The only error of importance which we have observed in figures is the amount given for the Syms Operating-theatre, which he states at 1,837,500 dollars instead of francs ($350,000), which error appears twice in the book. We notice also that although the French language has a "y," yet "McBurney" appears as "McBurnet." Still more curiously, Yale University appears throughout the book as "Iale." Other than these trifling defects the accuracy of the book is very remarkable—not only in the spelling of foreign names, where errors might be expected, but, so far as we have observed, in his description of our methods and results. We notice also that he very rightly states that nowhere will one meet with establishments better organized and more marvellously rich than at Johns Hopkins, the Syms Operating-theatre, and the Universities of Chicago and San Francisco.

Moreover, he draws a sharp distinction between the orthodox schools and the heterodox—under which he includes the homœopathic, eclectic, botanic, etc. He is evidently markedly in favor of women's medical schools, and gives forty pages to their consideration, including the higher education of women in general and especially their medical education. In a table opposite page 128 he gives a chronological survey of the gradual victories of women in seeking for admission to medical societies, beginning with Iowa and Kansas in 1872, and finishing with Pennsylvania in 1881. He notes that in San Francisco the male and female students dissect together, as at Paris and Brussels.

On the whole he justifies his study—in spite of our supposed Americanisms, and even (a term which strikes our transatlantic ears as a little odd) our "puffism"—by the originality and the rapid progress which he recognizes in this country, in his remark, "On marche là bas à pas de géant." He notes the rapid organization of schools in this country, and suggests that the race would be much better by the early death of a large number. Naturally he urges a longer course of study, but to those of us who are struggling with the possibilities of a four years' course, his desire that we shall prolong it to five, six, or even seven years, makes one shrug his shoulders. It shows, however, that the tendency both in this country and abroad is steadily toward a larger and broader medical education. His criticism that our entrance examinations are too lax, and that we ought at least to make our medical course five years and precede it by two years of scientific study may well be taken *au sérieux*. We note with pleasure his commendation of our dental schools and his hope that Belgium may follow in the same path.

W. W. K.

PROGRESS

OF

MEDICAL SCIENCE.

THERAPEUTICS.

UNDER THE CHARGE OF

REYNOLD W. WILCOX, M.A., M.D., LL.D.,

PROFESSOR OF CLINICAL MEDICINE AND THERAPEUTICS AT THE NEW YORK POST-GRADUATE MEDICAL SCHOOL AND HOSPITAL; VISITING PHYSICIAN TO ST. MARK'S HOSPITAL.

Antipyrine as a Vesical Analgesic.

M. E. Vigneron, from his observation of three cases, believes that this drug can render some service in urinary surgery. The first point established is that in the bladder it is perfectly harmless, even after a usage prolonged through months. In depicting the very profound and extended lesions of the bladder which increase the power of absorption of the mucous membrane and which contra-indicate the use of cocaine—which may be dangerous even in a healthy bladder—there has not been observed any general accident, neither on the part of the skin nor in the digestive tract, nor any interference with the function of the kidneys. Even a local tolerance may be found. Antipyrine has already been used in the bladder as a hæmostatic, without any result, it is true, but also without any complication and without especially increasing the infection. It can, then, be considered as a sufficient antiseptic, even better than the boric solutions. As an analgesic, its solution. left in the bladder, suppresses painful contractions. When it is placed only temporarily in the bladder for the purpose of suppressing the pain which may be produced later by a local application, it still has an analgesic action but it is less marked. If the percentage of the solution is low (1 to 200) it does not act, or only slightly, and provided that it be kept in place for a long time—twenty minutes at least, which is far too long for practical purposes. A stronger solution (1 to 25) acts sufficiently, in ten minutes, for diminishing the pain of an instillation or washing to be subsequently made. This treatment is indicated in all cases of cystitis in which topical treatment is painful. In bladders which are not distended, two and one-half to five drachms of the last-named solution left for ten minutes is sufficient. For distended bladders six times this quantity of a solution (1 to 100 or 200) is necessary after a preliminary washing, and this should be left in the bladder. —*Annales des Maladies des Organes Génito-urinaires*, 1894, No. 5, p. 348.

The Treatment of Chronic Cystitis by Instillations of Corrosive Sublimate.

Dr. Ant. Barbier notes that it is inconvenient to distend the bladder in cystitis, and besides it is excessively painful, so that washing with more or less large antiseptic solutions is hardly satisfactory. Under the use of instillations the number of daily urinations decrease from thirty to six or eight, and the bladder capacity increases. The pain rapidly disappears, ordinarily in the first days of treatment; even if it is not completely relieved it is markedly lessened. Urine which is turbid, sanguinolent, containing more or less pus, clears up under the influence of sublimate. The various microbes diminish and disappear as the local condition improves. The instillations should be employed every day, commencing with 1 to 2000 and gradually increasing the strength until 1 to 500 is reached. In the bladder 30 to 75 drops is a sufficient quantity. At the neck and in the deep portion of the urethra 10 to 15 drops is sufficient. The solution should be prepared without alcohol, and four times as much tartaric acid as one uses of sublimate should be added.—*Revue de Thérapeutique Medico-chirurgicale*, 1894, No. 8, p. 203.

The Absorption of Iron in the Animal Body.

Dr. A. B. Macallum calls attention to the fact that Bunge's researches have in recent years done much to unsettle the medical dogma that the iron contained in drugs enters directly into combination with the red corpuscles to form hæmoglobin. Regarding his theory of the direct conversion of iron-containing nucleins in the food ("hæmatogen") into hæmoglobin as extremely doubtful, the author has attempted to determine, first, whether or not inorganic compounds of iron are absorbed, and secondly, whether certain organic compounds of iron are absorbed. Although the experiments under the second head are not yet completed, the following conclusions are submitted: 1. The experiments on the administration of inorganic compounds of iron to guinea-pigs and other animals, have resulted in showing that the intestinal mucosa absorbs these to an extent which varies with the nature of the compound and the quantity of it given. When the dose is small, absorption occurs only in that part of the intestine adjacent to the pylorus and measuring only a few inches in length; but when the quantity given at any one time is large the absorptive area may embrace the whole of the small intestine. In the former case the result appears to depend on the complete precipitation, as hydroxide, of the iron of the salt unabsorbed, in the thoroughly mixed bile, chyme, and pancreatic juice; in the latter case the large amount of the iron salt apparently first destroys the alkalinity of these fluids, the excess of the salt unaffected and remaining in solution then undergoing absorption. 2. The intestinal epithelial cells transfer the absorbed iron at once to the underlying elements when the quantity absorbed is small, but with a large amount absorbed, the epithelial cells are found to contain some of it. 3. Though some of the sub-epithelial leucocytes of the villi appear to carry part of the absorbed iron into the general blood-circulation, probably the more important agent in the transference of the inorganic iron from the villi to other parts of the body is the blood-plasma. 4. Marfori's albuminate

and the commercial "peptonate" of iron, when administered to guinea-pigs, seem to stimulate the leucocytes to invade the epithelial layer of the intestinal villi. 5. Of the organic iron compounds belonging to the "chromatin" class, that found in egg-yelk (hemætogen of Bunge) undergoes absorption in the intestine of the guinea-pig and of *amblystoma*. In these, but more especially in the latter, after they are fed with egg-yelk for several days, the cytoplasm of the liver cells yields a marked evidence of the presence of an organic iron compound belonging to the "chromatin" class and derived from the yelk fed. 6. The mode of absorption of yelk "chromatin" is obscure, but the process appears to be in some way connected with the absorption of the fat with which the iron compound is closely associated in the yelk.—*The Journal of Physiology*, 1894, Nos. 3 and 4, p. 268.

Solution of Gold and Arsenic Bromides.

Mr. Fred. A. Sieker contributes a timely paper upon this subject, which is receiving so much attention and about which so many contradictory statements have been published. He concludes: 1. An aqueous solution of arsenous bromide and gold bromide has not been accomplished. 2. Bachmann's and Barclay's solutions contain gold bromide, arsenic acid, and hydrobromic acid. 3. Arsenic bromide ($AsBr_5$) has never been isolated.—*Notes on New Remedies*, 1894, No. 12, p. 179.

The Physiological Action of Sparteine.

Dr. David Cerna, noting that this drug although used extensively in practical medicine has not been investigated physiologically to any extent, reports a series of experiments. The results are as follows: On the muscular system, after minute doses, there is a brief period of increased muscular irritability, which, however, soon disappears. No marked depression of normal irritability has been noticed even under massive quantities of the drug. On the nervous system there is no direct proof, experimentally or clinically, that this agent acts as a narcotic. Its influence is exerted particularly upon the lower nervous system, and in moderate, especially small doses, causes an increase in the reflexes, and this increase is of centric origin. This stimulation of reflex activity is generally followed by a distinct depression. Sparteine so stimulates the system as to cause convulsions, usually of a tetanic nature. This phenomenon is not the result of a peripheral action of the drug, but is spinal in origin. So also when death occurs, the paralysis is the result mainly of its action on the cord itself. On the circulation, if the drug is introduced into mammals intravenously, there occurs at first a slight rise of the arterial pressure accompanied with an increased action of the heart. In a short time both the rate of the pulse and the height of the blood-pressure fall below the normal standard, to return, if the dose is not pushed, to the original point. If the ingestion of the drug, however, be continued, the depression, with slight variations, is gradual until the occurrence of death of the animal. A noticeable phenomenon is the enormous increase in the size of the individual pulse-waves accompanying the reduction of or the frequency of the cardiac beat and the fall of the arterial pressure. Ex-

periments upon the heart showed that the drug powerfully stimulates the cardiac muscle and probably also the intra-cardiac ganglia. Finally these become completely paralyzed, and the organ is arrested either in systole or diastole. Finally, it is seen that the actions of this drug upon both the arterial pressure and the rate of the pulse, in normal animals are not by any means constant, the effects being undoubtedly dependent not only on the size of the dose administered but also upon which one of the actions predominates.—*American Medico-Surgical Bulletin*, 1894, No. 7, p. 392.

The Strength of the Pharmacopœial Tinctures.

The editor calls attention to the danger which attends the use of preparations of Calabar bean. The last edition of the U. S. P. has increased the strength of the tincture of physostigma in the proportion of 68 to 38. Tincture of gelsemium is one-seventh stronger, and tincture of stramonium is twice approximately as strong as in the previous edition. On the other hand, the strength of the tinctures of Indian cannabis, musk, and veratrum viride has been reduced.—*Bulletin of Pharmacy*, 1894, No. 5, p. 197.

Vaccination by Grattage.

Dr. Ortega has noted in the epidemic of smallpox which occurred in Mexico in 1890, that a large number of railway employés who contracted the disease presented the very large and unsightly cicatrices of vaccination by *grattage* (scraping). Among those vaccinated by *piqûre* (sticking) a very small number only contracted the disease, and in these it was mild, while in those vaccinated by grattage it was, in general, severe. The re-vaccination by piqûre in those previously vaccinated by grattage was almost always successful, while this was the exception in those vaccinated by piqûre. The patients vaccinated by grattage almost always suffer from inflammations in the vaccinated member of greater intensity and of longer duration than subjects vaccinated by piqûre. Finally, vaccination by the former method frequently produces cicatricial keloids. The pustules developed by grattage are probably septic, not vaccine pustules, because the larger surface allows the absorption of septic elements, while by the piqûre, although repeated several times, vaccine lymph only is introduced.—*Bulletin gênêral de Thêrapeutique*, 1894, 16e livr., p. 369.

The Treatment of Tuberculosis by Cinnamic Acid.

Dr. Albert Landerer states that this remedy and its salts, in a 5 per cent. solution, is in the highest degree productive of a leucocytosis, which begins within two hours after intravenous injection, and reaches its maximum in eight hours, the leucocytes being increased two and one-half fold. In intramuscular and subcutaneous injection there is also a leucocytosis, but much less than from intravenous injection. The number of red corpuscles is not lessened nor the hæmoglobin decreased. Eighty-four cases of internal tuberculosis were under observation. A five per cent. watery emulsion of sodium cinnamate was used for intravenous injection in large doses, three times each week; in severe cases, six to eight weeks must elapse before improve-

ment is noticeable. Intravenous injection is not difficult, but absolute asepsis must be observed. The results obtained seem to have been excellent, and the most favorable termination which could be desired—the production of fibrous tissue and walling-in of the process—was reached. The relief seems to be permanent in the various stages when secured.—*Therapeutische Monatshefte*, 1894, Heft 2, S. 47.

[The amount of the drug to be used is not stated.—R. W. W.]

The Action of Calomel and Olive Oil.

Victor Schultz has noticed that in a patient upon whom a necropsy demonstrated that no gall-stones existed, a few hours after the administration of olive oil the gall-bladder, which up to that time had been soft and insensitive, became very tense, sensitive, and painful, and then acquired that degree of painfulness which could be characterized as gall-stone colic. The significance of the fact is that the ingestion of olive oil is followed by a marked excretion of bile. As regards calomel, it has no influence upon a markedly increased biliary excretion; but rather, in gall-stones and diseases of the biliary passages, it acts not by increasing the biliary excretion, but by its disinfecting properties, thus diminishing the abnormal irritation of the mucous membrane of the gall-badder.—*Berliner klinische Wochenschrift*, 1894, No. 6, S. 132.

The Injection in Pneumonia and Typhoid Fever of Serum from Convalescents.

Drs. W. E. Hughes and W. S. Carter present the result of the study of fourteen cases of pneumonia. The serum was obtained most frequently by venesection, occasionally by blistering. It was injected subcutaneously, the method having been found to be as efficacious and less dangerous and troublesome than intravenously. The amount used varied from five to twelve drachms. From a therapeutic standpoint the results were disappointing. In the ten cases where perfect serum was used there were three deaths; with the imperfect serum one in four died; this is about the usual death-rate. The injections, if carried out with proper precautions, are perfectly harmless. In none of the cases were any bad general effects noted. In two cases local inflammation followed the injection. However, serum should not be obtained from a case where there is any suspicion of kidney-lesion, for it has been found that serum drawn from victims of Bright's disease is capable, when introduced intravenously into dogs, of producing nephritis. Three cases of typhoid fever are reported. The serum was obtained by venesection from convalescents in whom somewhat less than two weeks had elapsed since the end of the fever. These cases were none of them especially grave, and would certainly have recovered in the natural course of events. If the serum had any immunizing effect it acted as would have been expected, not by producing any sudden fall of temperature, but by bringing on the gradual termination of the fever sooner than otherwise it would have occurred. In these cases the fever terminated on the twenty-second, eighteenth and twentieth days respectively, which is somewhat unusual for three consecutive cases. In spite, then, of the mild nature of the cases, and the somewhat irregular action

of the serum, they are inclined to the opinion that the serum had some effect. *Therapeutic Gazette*, 1894, No. 6, p. 365.

The Treatment of Obstructive Icterus.

Dr. Dujardin-Beaumetz divides this condition into three classes with reference to its causation: 1. Obliteration from a calculus. 2. Obliteration from inflammation. 3. Obliteration from compression by tumors—the last belonging exclusively to the domain of surgery. Hepatic calculi are more frequent in women, and it is probable that the corset is an important factor in their causation, which is further aided by the usual costo-superior type of respiration. In these cases systematic massage can do much in relieving the causative factor. Of the cholagogues, the watery alcoholic extracts, as podophyllin, cascarillin, and euonymin, and even sodium salicylate, can be of service. To these should be added alkalies, as the waters of Vichy or Vals. For the treatment of hepatic colic two agents have recently been introduced—oil and glycerin. The oil has been the subject of numerous papers, and has achieved considerable success, but it possesses the marked inconvenience of being repugnant to the patients, and they swallow with considerable difficulty, at one time, the large amount (seven ounces) which is required. Glycerin in much smaller quantity, two and one-half to five drachms, appears to be equally effective, either given clear or mixed with water. If the latter fails, then it is necessary to resort to anodyne suppositories, ether sprays over the hepatic region, hypodermatic injection of morphine and atropine, or even to chloroform if the pain is acute. The obliteration from inflammatory action, which is usually the consequence of a duodenitis, requires different treatment. The duodenitis may be the result of an excessive alimentation in quality and quantity, or an incomplete mastication. It is necessary to regulate and increase the number of the meals—for each meal, by giving rise to reflex phenomena, produces an increased flow of bile. Irritant foods must be avoided—those which increase the gastric acidity, especially alcohol and liquids containing it. In the advanced stages it is necessary to resort to intestinal antiseptics, of which the most in use are salol, benzonaphthol, and the salicylates. Salol, usually the best of all, is here unavailing, because the bile being arrested, the contents of the duodenum are acid, and no decomposition of the drug occurs. To obtain antiseptic effects from benzonaphthol one drachm or more each day is required. Of the salicylates, bismuth salicylate is the best. Since this colors the feces it is difficult to arrive at a true understanding of the patient's condition; to avoid this inconvenience asaprol has been substituted with advantage. Calomel is useful because it is at the same time a purgative and an antiseptic; but it should be used with caution if the treatment is to be prolonged. Constipation is always an important symptom, and the use of Rubinat, Carabana, Villacatras, and even Carlsbad is advisable. Pancreatin may be useful in some cases.—*Bull. général Thérapeutique*, 1894, 18e livr., p. 385.

The Dietetic Treatment of Phthisis.

Dr. Henry P. Loomis formulates the following rules: 1. Never take cough mixtures if they can possibly be avoided. 2. Food should be taken at

least six times in the twenty-four hours; light repasts between the meals and on retiring. 3. Never eat when suffering from bodily or mental fatigue or nervous excitement. 4. Take a nap or at least lie down for twenty minutes before the mid-day and evening meals. 5. Take only a small amount of fluid with the meals. 6. The starches and sugars should be avoided, as also all indigestible articles of diet. 7. As far as possible each meal should consist of articles requiring about the same time to digest. 8. Only eat so much as can be easily and fully digested in the time allowed. 9. As long as possible systematic exercise should be taken to favor assimilation and excretion; when this is impossible, massage or passive exercise should be undergone. 10. The food must be nicely prepared and daintily served—made inviting in every way. He proposes the following as a diet-sheet in the early stage: On awakening, eight ounces of equal parts of milk and seltzer, taken slowly through half an hour. Breakfast: oatmeal and cracked wheat with a little sugar and an abundance of cream, rare steak or loin chop with fat, soft-boiled or poached egg, cream toast, half-pint of milk, small cup of coffee. Early lunch, half-pint of milk or small teacup of squeezed beef juice with stale bread. Mid-day meal: fish, broiled or stewed chicken, scraped meat ball, stale bread, and plenty of butter, baked apples and cream, two glasses of milk. Afternoon lunch: bottle of kumyss, raw scraped beef sandwich, or goblet of milk. Dinner: substantial meat or fish soup, rare roast beef or mutton, game, slice of stale bread, spinach, cauliflower, fresh vegetables in season (sparingly).—*The Practitioner*, 1894, No. 311, p. 321.

The Treatment of Nocturnal Enuresis.

Dr. Donald MacAlister, having first ascertained that no condition requiring surgical interference exists, uses atropine in doses gradually increased to the full limit of tolerance, and in no instance, out of some twenty cases, has failed to bring about a cure. He combines the atropine with strychnine, and increases the dose, which is given at 9 P. M., until one-tenth of a grain is reached. If it is necessary for the patient to use his eyes, a solution of eserine salicylate is instilled into the eyes, but the atropine is not discontinued. No fluids are allowed after 6 P. M.; the patient is awakened at 10 P. M., midnight, and 6 A. M., for the purpose of emptying the bladder. The secret of success lies in courageous overdosing; the addition of strychnine probably diminishes the depressant effects of large doses of atropine, and increases the sensitiveness of the vesical centres to reflexes from the bladder walls.—*The Practitioner*, 1894, No. 311, p. 331.

The Treatment of Diabetes.

Dr. Adolf Michaelis reports a single case in which he used sodium salicylate in the daily amount of from two to two and one-half drachms. After two months' use of this remedy symptoms of intoxication appeared, which ceased after a few days. During this time, although there were no especial errors or excesses in diet, the sugar continued to be excreted, in spite of the fact that ordinarily the remedy was well borne.

Dr. Lenné has treated a patient with the fluid extract of syzygium jam-

bolanum cortex, which he has used in the dose of four drachms in water one or two hours after meals thrice daily. Observation during nearly a month showed only such variations in the amount of urine, specific gravity, percentage of sugar and of urea as are usually seen when no medication is carried out. He concludes that this preparation has just as little influence upon sugar excretion as he had formerly found the powdered fruit to possess.—*Therapeutische Monatshefte*, 1894, Heft 5, S. 204.

MEDICINE.

UNDER THE CHARGE OF

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APEX DIASTOLIC BRUIT IN HEART DISEASE OF CHILDREN.

THEODORE FISHER (Bristol) draws attention to the occurrence of this murmur in cases of adherent pericardium with dilatation and hypertrophy. In 13 cases occurring in the Guy's post-mortem records, in 5 a diastolic or a presystolic bruit had been present during life, and in every case the mitral orifice was dilated and the aortic valves free from thickening.

The writer rejects the view that it is due to relative contraction of the orifice owing to the large size of the cavity. In some of the cases a *systolic* thrill is also present.

"Dr. Cheadle has noticed the frequency of a diastolic sound in the early endocarditis of children, and states that, although it may disappear, it generally develops into the presystolic *bruit* of mitral stenosis.

"Possibly the diastolic sound that disappears, although indistinguishable at this stage from that of early mitral stenosis, may indicate temporary dilatation of the heart. The sound heard in the diastolic interval in association with a dilated heart may be either a sound separated by an interval both from the second or the first sound, or it may be a low-pitched presystolic rumble. As is well known, the presystolic *bruit* of mitral stenosis may often be replaced by a diastolic sound. The soft presystolic rumble of a dilated heart may also alternate with a diastolic sound.

"The presystolic rumble of a dilated heart is, however, probably too low pitched to lead to much difficulty in diagnosis, and, when changed for a

diastolic sound, the accentuation and rhythm may be that of the *bruit de galop*. There is, however, a diastolic murmur heard in the dilated heart of children which is presumably due to that dilatation, and is indistinguishable from the diastolic sound of mitral stenosis. It may be best heard at the impulse or just outside it, or over the right ventricle in the third and fourth or fourth and fifth intercostal spaces. In one position it is probably produced in the left ventricle, in the other in the right. In the same heart it may sometimes be best heard in one position, sometimes in the other, and then probably points to general dilatation.

"Whether such a murmur indicates mitral stenosis or dilatation of the heart is of some importance. Adherent pericardium is the most common cause of a dilated heart in childhood, and death from such a cause is far more common than from mitral stenosis. Thus the post-mortem reports at Guy's for seven years showed that there were only 3 deaths from mitral stenosis of the age of fifteen years and under, while there were 13 deaths from cardiac disease with adherent pericardium, in which valvular disease was either absent or there was merely slight thickening of the mitral valves. Apparently very few children with adherent pericardium survive the age of fifteen, while mitral stenosis is not uncommon in young adults. This suggests that the immediate prognosis is considerably worse in the former affection. A diastolic sound, therefore, indicating persistent dilatation of the heart, is probably of far more serious import than one pointing to mitral stenosis."—*British Medical Journal*, 1894, No. 1739.

Sudden Insensibility after Extreme Muscular Exertion.

Poore (London) records the following case (*Lancet*, 1894, No. 3687): A strongly built man, aged twenty-one, was admitted to University College Hospital in an unconscious and irritable condition on February 25th. He had travelled to London, 120 miles, on the previous day to run in a ten-mile race, for which he had been training for some time. He felt out of sorts when the race began, but did a good time of 66½ minutes across very heavy country. During the race he did not perspire as much as he ought to have done, and afterward when he went to the dressing-room he felt very thirsty and drank off about a pint and a half of cold water. After this he became ill, did not recollect dressing himself, and, in fact, remembered nothing more until he found himself in the hospital next evening. His friends state that the race was finished about 5.45 P.M., and after this the patient dressed himself with very little assistance, but he did not seem well; he appeared "overrun." Just after leaving the dressing-room with his friends he "fainted." They gave him some brandy, but, as he became unconscious and helpless, they carried him to a neighboring house and laid him down on the floor. Here he lay quite still, with semi-closed eyes, occasionally groaning as though in pain. His breathing was stertorous, and his pupils are said to have been dilated equally and his teeth clenched. He continued thus until 7 P.M., when he began to have convulsions, which appear to have been epileptiform in character. They came on with intervals of one or two minutes, in which the breathing was stertorous and the patient was quite quiet. A considerable quantity of saliva ran from his mouth, but he did not bite his

tongue. At 8 P.M. the convulsions became so violent that it was found necessary to restrain the patient, and at 11 P.M. he was given a hypodermatic injection of morphine. This controlled the fits, and he lay quiet during the rest of the night, but was quite unconscious. All next day, February 25th, he remained in the same condition, and in the evening was brought up to hospital. On admission he was in a state of extreme cerebral irritation. The pupils were equal and semi-dilated; the breath foul; the man would not answer questions or put out his tongue; the pulse was regular, full, and bounding; the urine normal. Attempts to feed by the nasal tube had to be given up on account of the violence of the patient. He then sat up in bed, seemed quite rational, drank a pint and a half of milk, and took three grains of calomel. He was restless, but quite conscious during the night. There was some headache on the following day, and the patient left the hospital on March 4th, no bad symptoms having developed in the interval.

In his remarks on the case, Poore considers as probable factors in the causation, waste products circulating in the blood, hyperpyrexia from suspension of sweating, and possibly sudden cerebral anæmia from drinking a large quantity of cold water after the race.

Diphtheria of the Genitals followed by Paralysis.

Gayton (London) mentions the case of a well-nourished girl of four years admitted to hospital with membranous diphtheria of the pudendum and groins. There was slight albuminuria and no fever. After three weeks the local condition was healed, but the albuminuria persisted. A week later strabismus was noted, and in the course of a few days paralysis became almost universal and eventuated in death by asphyxia. There had never at any time been any affection of the fauces or naso-pharynx. It is noted that out of 2733 cases which have come under observation, in only 6 were the genitalia affected.—*Lancet*, 1894, No. 3691.

The Pathogenesis and Treatment of the Delirium of Pneumonia.

At the Eleventh International Medical Congress recently held at Rome, Robert (*Le Mercredi Médical*, 1894, No. 19, p. 230) dilated upon the gravity of the delirium of pneumonia, especially by reason of its inhibitory influence upon the tracheo-bronchial reflex centre, which, it has been demonstrated, is situated in the dorso-lateral portion of the pneumogastric centre. It was pointed out that the cerebral disturbances that appear in the course of an attack of pneumonia do not have a common pathogenesis. The most rational explanation is to be found in the action of various toxins or toxalbumins. The delirium that occurs during the period of engorgement and red hepatization is probably due to hyperæmia of the cerebral membranes; that occurring during the period of gray hepatization, to the meningeal complications resulting from secondary infection; that occurring during the period of defervescence, to cerebral anæmia or perhaps to passive congestion. The delirium of active cerebral hyperæmia is characterized by great agitation and marked insomnia; the face is red, the sclerotics injected, the pupils contracted, the pulse as a rule frequent and strong. Therapeutically, anti-

pyretics, cerebral derivatives, and bleeding are indicated. In case of passive hyperæmia, the condition is one of tranquillity and incoherence alternating with periods of somnolence; the general state is rather typhoid. Cardiac and cerebral stimulants are indicated. In case of cerebral anæmia the delirium is of reasoning character, the patient being loquacious in alternation with hallucinations of agreeable or frightful character. Opium, alcohol, and sedatives will be required.

Hysterical Deafness.

At a recent meeting of the French Society of Otology and Laryngology, Cartaz (*La Médecine Moderne*, 1894, No. 37, p. 583) discussed the auditory manifestations of hysteria and took the ground that the rarity of their occurrence is apparent rather than real. Deafness, however, in association or not with other profound evidences of hysteria, such as mutism and ocular derangement, he admitted to be exceedingly uncommon. Fifteen cases of hysterical deafness have been collected, and Cartaz reported two additional ones. One occurred in a girl of sixteen who, when she came under observation, had been deaf and mute for two days. She had menstruated for two years, the periods having been irregular at first; from time to time at the menstrual periods she appeared apathetic and with a disposition to weep without obvious cause. Two days before coming under observation, in the course of a heated discussion with a companion she received a slap in the face. She appeared for the moment stunned, but at once broke into tears. Her mother spoke to her, but received no response. The girl made movements with her lips, as if she wished to speak, but did not succeed in enunciating any words. She seemed not to understand what was said to her. The treatment consisted in the application of the constant current, sometimes only by suggestion, sometimes actually, and recovery soon ensued. The second case presented an even more rare association than the first. In this there was both blindness and deafness of hysterical origin, which readily disappeared under the influence of magnetism.

Two Cases of Hereditary Chorea in Twins.

Russell (*Birmingham Medical Review*, vol. xxxv., No. 185, p. 31) reports the case of a man, thirty-four years old, who presented marked choreiform movements of the face, trunk, and limbs of seven years' duration. In addition to many extremely irregular movements, especially of the trunk and arms, there was a decided tendency toward the constant repetition of a few more definite actions. This was more marked in the face, the right angle of the mouth being drawn up every few minutes to its extreme limits, and the orbicularis palpebrarum contracting at the same time. There was a tendency to throw the arms for a moment into a position of rigid extension before any voluntary movement could be carried out. The legs also tended to become rigid in walking, giving an almost spastic character to the gait. Most of the movements continued to a certain extent during rest; they ceased, however, during sleep. The knee-jerks were exaggerated and slight ankle-clonus could usually though not invariably be elicited. The electric reactions were practically normal. There was no difficulty in micturition or in defecation. The

optic disks and the heart were unaffected. The mental condition appeared to be a little impaired. A twin brother of the patient presented similar symptoms, which had appeared a little earlier than in the case of the latter. In this case the legs are said to have been affected first. During rest the only movement observed was a frequent throwing back of the head and retraction of both corners of the mouth. The gait was spastic, the reflexes greatly exaggerated; ankle-clonus was easily elicited. The mental condition was good. The father of these two brothers had suffered from gradually increasing chorea for the last nine years of his life, and died in a condition similar to that presented by the children. Another brother is said to have suffered from a slight and temporary attack of chorea at the age of twenty-three years. Three sisters and two other brothers were quite healthy. [One cannot read the history of the two cases here detailed without having brought to mind the clinical picture of spastic hemiplegia of cerebral origin.]

The Blood in a Case of Rapidly Fatal Pernicious Anæmia.

Askanazy (*Zeitschr. f. klin. Med.*, vol. xxii.; *Provincial Med. Journ.*, vol. xiii., No. 146, p. 101) has reported the results of a microscopic examination of the blood in a case of rapidly fatal pernicious anæmia. In addition to numerous morphologic abnormalities among the erythrocytes there was observed among many of these a deviation from their usual tinctorial properties, which has been designated anæmic degeneration; thus many of the erythrocytes assumed under the influence of Ehrlich's mixture a reddish-yellow or glittering, rosy hue, whilst with Plehn's solution or hæmatoxylin-eosin, they stained a distinct violet, and in addition to this frequently exhibited a very fine blue-black granulation. A large number of nucleated red corpuscles were found in addition to the anuclear forms, and the megaloblasts exceeded the normoblasts and presented peculiarities as to staining. It was also observed that the nucleus of many of the normoblasts did not present the usual circular shape; this was sometimes polymorphous and sometimes accompanied by accessory nuclei. In many instances, in addition to a rosette-shaped principal nucleus, the whole body of the cell was strewn with coarser and finer chromatin corpuscles; in other similarly shaped cells a principal nucleus could not be detected. This peculiar behavior of the nuclei is designated karyolysis, a metamorphosis of the nucleated red corpuscles into the non-nucleated, fully developed forms. Karyokinesis of the red blood-cells was also observed. Mitoses were detected and "fixed" in various stages, and in one fresh, unstained preparation the whole process was observed from beginning to end in one red blood-cell.

Two Unusual Cases of Pyrexia.

Short (*Birmingham Medical Review*, vol. xxxv., No. 185, p. 27) has reported a case of anæmia attended with hyperpyrexia, and a case of enteric fever complicated by ague. The first case occurred in a female, twenty-eight years old, who came under observation on account of weakness. She was extremely anæmic, slept badly, and was not taking food well. For twenty-four hours the temperature ranged between 98° and 99°, but on the following

day it rose to 102°, falling the next morning to normal. The day after this it rose again and continued rising during the next twenty-four hours, until it reached 102.4°, when there occurred a distinct rigor. Five grains of quinine were now administered and the temperature fell to normal during the succeeding twenty-four hours, and sweating took place. During the following two weeks the temperature pursued an irregular course, rising to over 102° within every twelve hours, and usually subsiding to about 99° after the exhibition of quinine. On two occasions it rose to 104° and 106° despite the administration of large doses of quinine. The elevation of temperature was sometimes attended with rigors and sometimes not. Throughout the whole period of observation there was no enlargement of the spleen, no external evidence of pus, and no sign or symptom of tuberculosis. There was no reason to believe that enteric fever existed. Hysteria was excluded and special care was taken to exclude the possibility of deception. Under treatment with iron, in addition to the quinine, recovery ensued.

The second case occurred in a man, twenty-nine years old, who came under observation on about the fourteenth day of an attack of enteric fever, and seven days later had a rigor, with a rise of temperature to 104°, followed by profuse sweating and a decline of the temperature to 95.4°. On the following day the temperature again rose, to fall subsequently. On the next day a rigor occurred and was followed by a decline of the temperature to 95.6°. On the fourth day the enteric fever seemed to resume its ordinary course and uninterrupted recovery thereafter ensued. [In both of these cases the diagnosis would have been greatly strengthened by an examination of the blood for the presence of malarial plasmodia, and in the first such an examination would have disclosed the grade and character of the anæmia.]

Black Tongue.

Cianglinski and Hewelke (*Zeitschr. f. klin. Med.*, vol. xxii., No. 6; *Provincial Med. Journ.*, vol. xiii., No. 146, p. 101) give a *résumé* of the literature of the condition known as black tongue, and detail a case that came under their own observation. They describe the condition as a spotted, black discoloration of those parts of the tongue lying anterior to the circumvallate papillæ. The etiology is for the most part obscure, though various disorders of the digestive apparatus doubtless play a part in it. The course of the affection is variable, the discoloration in some instances disappearing rapidly, while in others a considerable time elapses before the deposit upon the tongue is cast off by desquamation. There is as yet no unanimity of opinion as to the pathogenesis, although the majority of authorities consider it to consist in a hyperkeratosis of the circumvallate papillæ, viewing the parasites that have been described in this connection as merely accessories. In the case detailed the whole of the tongue of a young woman as far as the boundary of the circumvallate papillæ suddenly became discolored in such a manner that it appeared to have received a coat of blacking. On treatment with borax this discoloration disappeared, and microscopic examination showed that it was due to the presence of hyphomycetes, which were capable of being cultivated at a low temperature in proper media, and it was observed that portions of

the zygospores were thickened and blackened, whence the discoloration of the tongue. In other respects the fungus was like *mucor rhizopodiformis*, except that it was not pathogenic for rabbits. The mildness of the complaint is explained by the fact that the fungus develops very poorly at the normal bodily temperature; indeed it was observed that as soon as the patient ceased to breathe through her mouth, the temperature of the latter was sufficient to destroy the mucor. [It is possible that black tongue is due to various causes. At any rate a blackish discoloration of the teeth will be found in many if not in all cases.]

Pseudo-hypertrophic Paralysis in Two Brothers.

Ram Narain (*Indian Medical Record*, vol. vi., No. 9, p. 272) has reported two cases of pseudo-hypertrophic paralysis in brothers, one seventeen, the other seven, years of age. In the latter the disease had been noticed for six months. At first the boy was clumsy in his movements, falling easily, and stumbling in ascending the stairs. Next, weakness of the lower extremities and difficulty in walking, together with a peculiar gait and attitude, were observed, and the muscles of the calves presented a nodular feeling. In standing, the legs were held far apart. The lad was unable to arise from the floor without assistance, and when a little help was given him he would raise himself up by placing his hands on his knees and then grasp his thighs a little higher till he pushed the body up. The patellar reflexes had disappeared, and a hollow in the back was beginning to make its appearance. In the elder boy the first symptoms of the disease were observed at the age of seven, just in the same way as in the younger. The onset, too, was gradual. His condition had become pitiable. He was quite helpless and entirely without power in the lower extremities, as well as in the muscles of the back. If, when made to sit up, his balance was disturbed, he would fall on his face and be unable to raise himself to the erect posture. Wasting had made its appearance in the muscles of the shoulder and back, while those of the calves had remained enlarged; the feet were clubbed. The reflexes were totally gone. Respiration, circulation, and digestion were not impaired, and general and special sensibility was perfect. Control of rectum and bladder was retained. Other than a little deficiency of the intellect, which had been present from the first, the mind was clear. The mother of the brothers was subject to attacks of rheumatism. A sister had died of sunstroke at the age of eight years. No other neuropathic family history could be obtained.

Malta Fever.

Hughes (*Sur une Forme de Fièvre fréquente sur les Côtes de la Méditerranée;* reprint [no date] from *Annales de l'Institut Pasteur*) has studied clinically and bacteriologically the peculiar fever encountered at Malta and other Mediterranean ports. It resembles in some respects typhoid fever, in some respects malarial fever. It is nevertheless a distinct affection, and a peculiar microbe, differing from Eberth's bacillus, is found associated with it; while both the latter organism and the plasmodium of Laveran are absent. The temperature is irregular. There are periods of fever of remittent type, lasting one

or two weeks, and separated by apyretic intervals of two or three days. In grave cases the temperature is continuous, and death may occur in hyperpyrexia. In obstinate cases fever may last six months or more. It is unaffected by quinine or arsenic. There is obstinate constipation, anemia, and progressive debility. Neuralgic and rheumatoid complications or sequelæ may be prolonged for two years. Immunity from typhoid fever is not given by Mediterranean fever or from the latter by typhoid fever. The mortality is about two per cent. The mean duration of stay in hospital is seventy to ninety days. The spleen is at first soft and enlarged. About the fifth or sixth week it becomes hard, and thereafter gradually shrinks to normal dimensions. The alimentary tract exhibits irregular patches of congestion, but Peyer's patches remain intact. The mesenteric glands are enlarged, but to a less degree than in enteric fever. Grave cases exhibit bronchitis or broncho-pneumonia. The *micrococcus Melitensis* is to be recognized morphologically and by culture. It has been found in the organs eight times by Bruce, in 2 cases by Gipps, and in 11 cases by the author—twenty-one in all. Bruce in 2 cases and the author in 4 cases, reproduced the disease in monkeys by inoculation of pure cultures of the micrococcus Melitensis.

SURGERY.

UNDER THE CHARGE OF

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APPENDICITIS, WITH ESPECIAL REFERENCE TO ITS TREATMENT.

J. WILLIAM WHITE, in an address on appendicitis, delivered before the Surgical Section of the College of Physicians of Philadelphia (*Therapeutic Gazette*, 1894, vol. xviii., No. 6) reviewed many of the important points relating to the cause, course, and diagnosis of appendicitis, and more especially to its treatment, about which great differences of opinion still exist in the profession.

These differences of opinion, it is remarked, are extraordinary, in view of the very frequent occurrence of the disease, and the large opportunity thereby offered for its careful study. A closer consideration of the subject must gradually tend to bring surgeons and physicians to a common ground.

The etiology is considered under (*a*) predisposing and (*b*) exciting causes. Among the predisposing causes mentioned are the low vitality and feeble resistance that characterize organs which in the process of evolution have

become functionless vestiges. In addition, the dependent position of the appendix, and its communication with that portion of the intestinal canal where inspissation of the contents first occurs, while at the same time it is removed from the direct fecal current, predispose to inflammatory attacks. The exciting causes are in the vast majority of cases either mechanical or bacterial (infective), the latter usually, perhaps, constantly being a sequel of the former, while it may be the *fons et origo* of the disease. In addition, tubercular or other general disease is, in rare instances, the source of appendiceal trouble.

The anatomical relations of the appendix are interesting in this connection. The process is usually curved upon itself on account of the shortness of the mesentery. Along the free border of the mesentery runs a small artery, which is the only source of blood-supply to the appendix. Distention of the ileum with gas, or of the head of the colon with gas or fecal matter, causes tension of the mesentery of the vermiform process with increased torsion of of the latter. This interferes with the blood-supply through the single vessel and, according to the degree of this interference, produces congestion and tumefaction, catarrhal inflammation, or ulceration or gangrene.

The bacterium coli commune is very constantly associated with appendicitis. This micro-organism is present in the alimentary tract in health, and becomes pathogenic and pyogenic when for any reason the integrity of the intestinal walls is lost. Thus, even a moderate constriction of the intestinal canal may enable the bacterium to penetrate its walls, while the virulency is much increased by any abnormal state, as diarrhœa or constipation.

It is now known that foreign bodies are very rarely the cause of appendicitis. The study of a large number of cases shows that not more than 4 per cent. of the cases are so produced. Fecal concretions have been found in 15 to 20 per cent. of the cases, and although they may in some instances be the cause of lesions of the mucous membrane which permit of bacterial invasion, they perhaps infrequently bear an etiological relation to the disease in question.

The comparative immunity of the female to this disease (women are affected only one-fourth or one-fifth as frequently as men) is explained by an additional blood-supply to the appendix through the appendiculo-ovarian ligament.

The usual symptoms of a mild attack of the catarrhal type are *pain*, at first diffuse, affecting the abdomen generally, and later localized entirely to the right iliac fossa, *localized tenderness*, most frequently at McBurney's point, *vomiting*, *moderate fever*, (99.5° to 101° F.), *increased pulse-rate* (90–110), and *rigidity of the right rectus muscle*.

The diagnosis must be made chiefly from stercoral typhlitis. The presence of a tumor at the very beginning of an attack of apparent appendicitis of mild type is the only symptom which can be considered as at all pointing to the latter condition. In doubtful cases it will be safer to consider the trouble appendicitis.

The treatment advised for a mild catarrhal case is as follows: *Absolute rest* should, of course, be enforced. *Starvation;* it is desirable in the acute attack that the patient should be given nothing but an occasional sip of water. The frequent inability of the stomach to retain food, and the certain inability of a portion of the intestinal tract to take care of the residue as well as the abso-

lute necessity of avoiding all sources of local irritation, abundantly justify this recommendation. The local use of *heat* and *cold*, and local *depletion* by means of leeches have about equal claims for employment. A preference is expressed, however, for heat or bloodletting. Objection is made to the use of blisters, iodine, and the various ointments, as they render the skin more or less unsuitable for operation, if this measure should become necessary. The author expresses the opinion that not enough attention has been paid to the "antiseptic" treatment of appendicitis.

If, at the end of forty-eight hours, or earlier, there is *severe, sharp* pain, increased tenderness and rigidity of the abdomen, and beginning tympany, either local or general, surgical interference offers by far the best chance for recovery. In the majority of the cases presenting these phenomena a perforation of the appendix wall has taken place, sufficient at least to permit of the passage of bacteria or their products. A case having reached this stage need not necessarily terminate fatally, but "there is absolutely no way of recognizing with any reasonable certainty which of these three events will follow: resolution and recovery; localized abscess, with from 90 to 95 per cent. of chances in the patient's favor; or general peritonitis with almost sure death if it is once well established." Hence the advice to interfere surgically.

Operation at this stage is usually easy. The incision should be two or three inches in length, placed obliquely with its centre a little outside of McBurney's point. In removing the appendix, when possible, a peritoneal flap should be reflected, the mucous coat ligated with a circular ligature, the cut extremity touched with pure carbolic acid, the flap of peritoneum brought over the end, and closed with Lembert sutures. When the peritoneum has become thickened and brittle, the whole thickness of the appendix may be included in the ligature, and the stump cauterized with pure carbolic acid.

Drainage will rarely be necessary, and the danger of ventral hernia following is very remote.

In the event of operation being refused by the patient or the medical attendant, Dr. White has been led to await events with more equanimity—1. If the bowels are loose; 2. If the pain is dull and throbbing, rather than sharp and lancinating; 3. If the spot of greatest tenderness is not precisely at McBurney's point; 4. If vomiting is not marked; and 5. If, without marked change in the general condition, increased resistance, slight dulness, and the presence of a mass recognizable by palpation indicate that a localized abscess is forming, shut off by adhesions from the general peritoneal cavity.

The period between the third and sixth days, if the symptoms do not ameliorate, is one of great anxiety, and the outcome very uncertain. As a rule, it is not a favorable time for operation, but the patient must be under close observation and operative measures employed if the indication arises.

Attention is called to the distinction between the conditions present in "chronic" and in "relapsing" appendicitis, and to the necessity of separating them in practice.

In conclusion, the author presents the following summary of his views on this subject:

1. The explanation of the great frequency of inflammation of the appendix is to be found in the following facts:

(*a*) It is a functionless structure of low vitality, removed from the direct fecal current; it has a scanty mesentery so attached to both cæcum and ileum that it is easily stretched or twisted when they become distended; it derives its blood-supply through a single vessel, the calibre of which is seriously interfered with or altogether occluded by anything which produces dragging upon the mesentery.

(*b*) In addition, there is almost always present a micro-organism—the *bacterium coli commune*—capable of great virulence when there is constriction of the appendix or lesions of its mucous coat or of its parietes.

2. The symptoms in a case of mild catarrhal appendicitis—general abdominal pain, umbilical pain, localized pain and tenderness on pressure in the right iliac fossa, vomiting, moderate fever, and slightly increased pulse-rate —cannot at present with any certainty be distinguished from the symptoms, apparently precisely identical, which mark the onset of a case destined to be of the very gravest type.

3. It must be determined by future experience whether or not operation in every case of appendicitis, as soon as the diagnosis is made, would be attended by a lower mortality than would waiting for more definite symptoms indicating unmistakably the need of operative interference. At present such indication exists in every case if the onset is sudden and the symptoms markedly severe, and whenever in a mild case the symptoms are unrelieved at the end of forty-eight hours, or, *a fortiori*, if at that time they are growing worse.

4. It must be determined by future experience whether cases seen from the third to the sixth day, which present indications of the beginning circumscription of the disease by adhesions, and which tend to the formation of localized abscesses, will do better with immediate operation with the risk of infecting the general peritoneal cavity, or with later operation when the circumscribing wall is stronger and less likely to be broken through. At present, operation is certainly indicated whenever a firm, slowly forming, well-defined mass in the right iliac fossa is to be felt; or, on the other hand, when a sudden increase in the sharpness and the diffusion of the pain and tenderness points to perforation of the appendix or breaking down of the limiting adhesions.

5. In the beginning of general suppurative peritonitis, operation offers some hope of success. In the presence of general peritonitis with septic paresis of the intestines, operation has thus far been useless.

6. Recurrent appendicitis of mild type, like acute appendicitis, frequently results from digestive derangements. Several attacks may occur followed by entire and permanent recovery, but it is as yet impossible to differentiate these cases accurately from those which do not tend to spontaneous cure. Operation is certainly indicated whenever the attacks are very frequent.

7. Chronic relapsing appendicitis is characterized by the persistence of local symptoms during the intervals and by more or less failure of the general health. Operation is usually indicated.

8. In either the recurrent or the chronic relapsing variety operation should be advised according to the following indications formulated by Treves: whenever (*a*) the attacks have been very numerous. (*b*) The attacks are increasing in frequency and severity. (*c*) The last attack has been so severe as to place the patient's life in considerable danger. (*d*) The constant

relapses have reduced the patient to the condition of a chronic invalid, and have rendered him unfit to follow any occupation. (*e*) Owing to the persistence of certain local symptoms during the quiescent period, there is a probability that a collection of pus exists in or about the appendix.

On Synovial Tuberculosis in Human Joints, from the Pathologico-Anatomical Point of View.

Koenig (*Centralblatt für Chirurgie*, 1894, No. 22), from a study of about 300 specimens of synovial tuberculosis, obtained either by resection or amputation, from the collection of the surgical clinic in Göttingen, arrives at the following conclusions:

1. Synovial tuberculosis is produced either from a focus of disease in the bone opening into the joint, or from a deposit in the synovial sac without such pre-existing focus—a hæmatogenous synovial tuberculosis. Accordingly, there is a variety affecting the bone primarily and the synovial membrane secondarily, and the primary synovial form. They begin with a serofibrinous exudation; this is not a special form of synovial tuberculosis, but is the first declaration of the disease.

2. This form of the disease may undergo resolution without leaving any pronounced change in the affected joint. More frequently the process goes further, the fibrin is partly deposited free in the synovial liquid in all forms, of the disease, but the greatest portion remains adherent to the synovial membrane and to portions of the cartilaginous surfaces, and in still greater quantity in certain points. It increases by the formation of successive layers; this undergoes a form of organization which becomes more pronounced as the layers increase. This organization takes place by vessels from the synovial membrane extending into the fibrinous layers. In those collections which appear on the cartilages, the vessels come from the border of the insertion of the synovial membrane. Following the appearance of the vessels a deposit of cells takes place; round-cell masses with giant cells are early observed. The extent of this change and the amount of the new formation determines the character of the tissue, whether fungous, cheesy, granulating, fibrinous, or puriform collections, while the interference with motion and the pressure depend upon the masses of lymph deposited (agglomeration in masses; smooth, superficial deposit on the free surfaces of the joints; the formation of tongues, polypoid attachments, the formation of rice-like bodies, etc.).

So long as the disease is progressive one finds on the surface of the organized formations a layer of unorganized fibrinous deposit. The newly formed tissue, and not the degenerated synovial membrane, forms the fungous or granulating swellings and fibroid new formations, and also the tubercles are found principally here, the cartilage and bone being involved secondarily.

3. In this tissue occur the changes which result either in the destruction or the cure of the joint. The destruction first affects the joint surfaces wherever the layers have formed and organized. The fibrinous deposits later become changed into granulation tissue. Microscopic study shows that in the destructive process the cartilage is at first passive, and is destroyed by the granulations. It is not at all necessary that the overlying granula-

tions contain tubercles, because entirely similar conditions occur after hemorrhage into a joint, in which the fibrin of the blood is deposited on the cartilaginous surfaces and organizes. After the cartilage is destroyed the bone is attacked, and this takes place, as a rule, in certain typical places, sometimes forming defects which, on account of their size and round form, look not unlike primary osteal deposits. Our whole teaching of the existence and frequency of primary osteal tubercle must be revised in view of these investigations. The number of such cases is certainly smaller than was formerly supposed. Not only is the bone and cartilage destroyed from processes beginning within the joint, but an osteomalacia affects the subchondral ends of the shaft of the bone, and the resulting granulations lift the cartilage from the bone. This granulating osteitis is not, as a rule, tuberculous, but it is prone to coexist therewith. Finally, it is pointed out that the cure of the tuberculous joint is effected through shrinking and cicatrization of the organized fibrin.

A New Method of Radical Operation in Large Umbilical Herniæ.

Gersuny has devised the following operative technique for cases of umbilical hernia, in order to guard against a recurrence (*Centralblatt für Chirurgie*, 1893, No. 43). After making the necessary incision, the sac is freed on every side by blunt dissection, then opened, the omentum is ligated, and the stumps with any coils of intestine returned. The sac is then cut off, and the peritoneum sutured on a level with the bottom of the wound. One next looks for the recti, the median borders of the sheaths of which are then opened with scissors. Several arteries will need ligation.

Button sutures are used to approximate the abdominal wound, first having used sutures for the peritoneum alone. The sutures are entered quite near the wound margin, to prevent inversion of the skin, and as the needle reaches the muscle a greater thickness is taken in order to bring the margins of the muscle together, when the sutures are tied, or the edges may even overlap. To prevent the formation of a pocket, Billroth's method is employed. This consists in including the sutured margins of peritoneum in every second suture of the abdominal wall. By this method the fibrous linea alba is eliminated.

The Restoration of the Penile Urethra in Patients with Stricture.

Lavaux (*Chir. Contemp. des Org. Génito-urin.*, February, 1894) reports a case of chronic urethritis with stricture, followed by urinary infiltration, and the formation of an abscess that extended from the balano-preputial junction distally, to the scrotal region, separating the aponeurosis from the spongy portion of the urethra, and forming a urethral fistula by opening externally. He found, after enlarging the fistula by an incision in the median line, that the urethra was destroyed with the exception of the quarter forming the roof for a great distance, about two centimetres remaining of the glandular portion. Although this portion would admit a No. 18 sound, the urine passed slowly. This was accounted for by a peduncleated tumor the size of a pea, that acted

as a valve in its proximal orifice. The incision was extended to the scrotal region, where the urethra was again found; it would only admit a No. 8 French sound. After resection of the strictured portion the largest possible catheter, No. 15 French, was passed through a stricture in the prostatic urethra, and a new floor for the urethra formed by uniting one flap of the fascia of the penis to the base of the other over the catheter by means of catgut sutures. The external wound was freshened, and then closed by silkworm-gut sutures. In spite of numerous erections, through careful local antisepsis the upper two-thirds of the wound and the abscess cavities healed by primary union, and there remained finally only a small fistula situated well forward, which could be easily closed by a second plastic operation.

The author concludes that where interference is strongly indicated, we should not hesitate to resect the urethra in the scrotal or penile portions, and follow it up by restoring the urethra, which will bring good results if strict local antisepsis is employed, and erections are prevented or lessened in number.

The thinness of the peri-urethral tissues in the penile portion of the urethra does not contra-indicate resection of traumatic strictures of small extent. The erections may be prevented by preliminary dilatation or use of the catheter and sounds in the prostatic urethra, lessening the irritability; by removing the catheter after the operation as soon as possible; by the avoidance of irritating antiseptics in the urethra. He advises the use of saturated and boiled solutions of boric acid or supersaturated solution of the same.

On the Extirpation of Goitre.

Wolff, in an article upon this subject (*Deutsche med. Wochenschrift*, 1893, No. 11), calls attention especially to three points:

1. The causes of death during or immediately after operations for the relief of goitre.

2. The later behavior of the portion of goitre which remains in cases of unilateral extirpation.

3. The use of methodical wound-compression in intracapsular extirpation of goitre.

With reference to the first of these, Wolff thinks the quantities of mucus that are raised from the stomach by the retching induced by the anæsthetic are frequently the cause of the sudden death. He mentions several cases, collected from literature, which he explains in this way. The treatment advised is to allow the head to hang down, and to wash out the throat with water. The reason the same accident does not occur during operations for other conditions is explained, the author believes, by the fact that in goitre the air-passage is narrowed until it resembles the sheath of a sword, while with normal air-passages no trouble would be experienced. After a considerable experience with removal of one-half of a goitre, Wolff has not observed any hypertrophy of the remaining portion, but, on the other hand, there is usually more or less diminution in its size. Nevertheless it is possible that after a transient reduction of the remaining portion of the goitre a recurrence may take place. Four such cases are mentioned. The relation between the narrowing of the air-passages is thought to be as follows: The goitre first

produces the narrowing, and then this causes further enlargement of the goitre. The lumen of the air-passage is diminished by the capsule of the gland growing intimately to it, and strangling it like a broad band. The growth of the gland, which depends upon the narrowing of the air-passage, can be arrested only by carefully removing the constricting band—that is, by separation of the capsule of the gland from the trachea. The more fully the air-passage is freed by thoroughly relieving the constricting band, the more securely the patient is assured freedom from increase in the size of the remaining portion and from recurrence.

Wolff concludes that the intracapsular enucleation is to be preferred, because the method is much safer than any other, because additional lesions, with their serious consequences, are much less apt to occur, and the difficulties in the technique are much reduced.

The Final Results in Two Hundred Operations for Goitre.

Sulzer (*Deutsche Zeitschr. für Chir.*, Bd. xxxvi. p. 193) reviews the cases occurring in the Canto Hospital in Münsterlingen, during the years 1868–1892. There were 55 male and 145 female patients, and 50 per cent. were between the ages of 15 and 30, or the period of development of the sexual functions. The majority sought relief from dyspnœa and not from dysphagia. The method by extirpation as advocated by Kocher was employed 44 times, 6 total and 38 partial extirpations. Marked softening of the trachea was never seen. Two cases had to have tracheotomy performed during and two after the operation, one of the former alone surviving. The author believes that the septic pneumonia which occurred in certain cases was caused by infection through the blood and not by inhalation. Cachexia thyropriva was observed in a boy twelve and one-half years old, but the symptoms passed away after a slight relapse. Tetanus was never seen. The author prefers to cut down to the capsule, which has a small arterial supply, before beginning to enucleate. Bleeding should be controlled by a firm silk interrupted suture. Bloodless operating may be secured by using the elastic tourniquet, as described by Bose, though it is not without danger, as it may drag upon the recurrent laryngeal nerve and produce dyspnœa. The use of all drainage has been abandoned in the last 32 cases without any harmful effect. In 83 cases primary union followed the operation. Three cases operated upon had Basedow's disease. In one case, after excision of the isthmus, a cure with only slight exophthalmus followed, which has lasted twelve years. A second case was improved, while the third was uninfluenced by the operation. In 10 cases of malignant tumors the results were not as good; 3 died in the hospital after the operation; 6 left with their wounds healed, but 3 of them had relapses later. In one case of especial interest portions of the œsophagus and trachea had to be removed. The wound of the œsophagus did not heal for some time, but finally closed by granulation. The transverse incision and silk for sutures are recommended. Lesions of the recurrent laryngeal nerve were not observed after enucleation, but occasionally follow extirpation, though they are not generally lasting in character. By extirpation, out of 23 cases 11 were free from relapse, while 4 required a second operation. Of 63 enucleations 44 were found free from relapse, and only 1 case required operation.

DERMATOLOGY.

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Hyaline Degeneration of the Epithelium of Carcinoma.

Unna (*Dermatologische Zeitschrift*, 1894, Heft 1), in a study of hyaline degeneration as affecting the epithelium of carcinoma, distinguishes nine chief forms. The first forms a division by itself; in this variety the degeneration appears as absolutely round globules of different sizes, usually in groups of four to ten, lying free between the epithelial cells, and having no connection with them, in the intercellular lymph-spaces. All other hyaline structures can be regarded as cellular and specially epithelial derivatives. They fall into two chief groups: the diffuse, unformed hyaline infiltration, and the formed, sharply circumscribed hyaline structures. The formed epithelial derivatives may be arranged under the following divisions:

1. Round balls of considerable size, which show in their interior the remains of a nucleus, or occupy the place of the nucleus, lying in the enlarged nuclear cavity, so that they are surrounded by a free space and are enclosed by the cell-body.

2. Irregular, oblong, spirally-twisted structures, with many protuberances, and frequently extending into long processes having the same color reaction as the body of the structure. This second group is to be regarded as containing structures of the same kind as the first, which have been given their distorted form through pressure.

3. From both the preceding forms a third is to be distinguished, somewhat smaller but also round, which lies in the nuclear cavity beside the nucleus, and has no nucleus-like contents.

4. These small structures without a nucleus are frequently drawn out as if provided with a stem, which often projects from the cell into a second nuclear cavity. The color reaction of this stem is precisely the same as the round body itself.

5. Besides the processes and stems of the nucleated and non-nucleated hyaline bodies, there are similar structures, not attached to the round forms, which extend as hyaline rods or spirals between the epithelial cells.

6. Both the next forms show capsule-like structures. One sees one or several well-preserved nuclei lying in a hyaline-degenerated vesicular (or, upon section, ring-shaped) cell.

7. A second form shows a shell- or vesicle-like hyaline structure, with nuclear contents and stem-like processes.

8. A third form of hyaline vesicle contains, instead of a nucleus, a nucleated globular body corresponding exactly to type 1.

A Mode of Treating Xanthoma Multiplex.

Leslie Roberts reports (*British Medical Journal*, May, 1894) favorable results in the treatment of a case of xanthoma of the hands, elbows, and buttocks, with the following lotion, which was painted upon the affected parts three or four times a day:

℞.—Acidi salicylici	. . . . .	ʒj.
Liq. epispastici	. . . . .	♏xv.
Ol. ricini	. . . . .	fʒj.
Æther. acetic.	. . . . . q. s. ad	fʒj.—M.

Under the application of this lotion the nodules grew appreciably smaller. After using it for a time, however, it seemed to influence the disease less than in the beginning of the treatment, and the following was substituted for it:

℞.—Acidi salicylici	. . . . .	ʒj.
Chrysarobini	. . . . .	ʒss.
Ol. ricini	. . . . .	fʒss.
Collodii flex.	. . . . . q. s. ad	fʒj.—M.

Under this application the nodules completely disappeared from the hands and fingers, but those upon the elbows and buttocks were but little influenced, owing, as the author believes, to the difficulty experienced in keeping the lotion effectually applied to these parts.

Xanthoma Multiplex.

Török (*Pest. med.-chir. Presse*, 1894, 44; also, *Monatsh. für prakt. Derm.*, September 1, 1893, p. 247) describes a case of a fifteen-year-old patient who one year before had jaundice, and six months later showed butter-yellow spots and papules, at first at the inner corners of the eyes, corners of the mouth, on the gums of the incisors, flexor surfaces of the joints, neck, abdomen, inguinal region, and palms. The microscopical examination showed always the presence of the so-called "xanthoma cells," that is, cells with one or more nuclei filled with fat-drops. The younger cells resembled the cells of developed adipose tissue and were grouped about the bloodvessels. The disease may be regarded, therefore, as a lipomatous growth. The fat tissue existing to a remarkable extent in the corium is "heterotopic," or out of place. The relation of the disease to icterus and diabetes is not as yet explained.

Angiokeratoma.

Charles Piffault (*Thèse de Paris*, 1894) summarizes our knowledge of this rare disease as follows: It is a mixed tumor, not congenital, which is met with especially in adolescence and in winter, seated upon the extremities of the limbs and upon the face, coincident with chilblains and local asphyxia. Histologically it is an angioma which develops primarily in the papillary

layer of the skin, and which by compression of the epidermis becomes hyperkeratosic, ending in the formation of a keratoma. It presents itself clinically in the form of small warty tumors, and of small, red angiectasic spots, disseminated or grouped, more or less numerous, of variable size and color. The formation of the verrucous tumors is always secondary to the flat spots, which themselves may constitute the whole affection. The evolution is very slow, and is without marked general symptoms. The diagnosis is easy, and the growth is benign. The best treatment is eclectrolysis.

Varicella and Variola.

Vetchtomoff, of Nijni-Novgorod (*Vratch*, No. 18, p. 455; quoted from *Brit. Journ. of Derm.*, March, 1894), alludes to Hochsinger's recent article in which he argues that varicella is identical with variola, and then gives the following case to show that varicella is an entirely different disease from variola, and that neither vaccination nor an attack of smallpox can protect against chicken-pox.

In a family with four children (two boys, aged eight and nine, and two girls, three and five), the two boys had been vaccinated in infancy, but the two girls had never been vaccinated. During a local epidemic of smallpox both girls contracted that disease, but the two brothers escaped, though in close contact with the sisters throughout the illness. Two years later, when an epidemic of chicken-pox occurred in the town, all four of the children were attacked with that disease and all speedily recovered.

Pruritus Ani successfully treated with Chlorinated Lime.

N. K. Berger (*Zemsky Vratch*, 1894, No. 13) inserts into the anus, about one inch deep, a pledget of cotton soaked in liquor calcis chlorinatæ, and left there until slight smarting occurs, when it is withdrawn, and the anus bathed with the same solution. The operation is to be repeated. Swelling of the parts or concomitant dermatitis, or eczema, are said to be cured by a few applications.

Cutaneous Eruptions of Gonorrhœa.

Leon Perrin (*Annales de Derm. et de Syph.*, October and November, 1893) points out that eruptions due to this cause (which are not to be confounded with those produced by cubebs and copaiba) are rare, and occur more frequently in men than in women. Individual conditions, such as excesses, fatigue, and complications, seem to favor their development. There is no special period when they are prone to appear, but the third or fourth week of the existence of the gonorrhœa is the most common time.

They consist of (1) purpura, (2) erythema multiforme and erythema nodosum, and (3) scarlatiniform and morbilliform lesions. Hemorrhagic symptoms are rare, and are usually met with in debilitated subjects, especially on the lower extremities.

The common form of eruption is erythema multiforme, and the mucous membrane as well as the skin may be affected. Constitutional disturbance and fever precede the disease of the integument. It tends to appear on the

neck and trunk rather than on the extremities, itching being slight or absent, and leaves in about a week, often with slight desquamation.

Concerning the nature of these manifestations, opinions vary greatly, but the most rational explanation, Perrin thinks, is that they occur through the medium of the nervous system. This would explain their frequent symmetry, their congestive character, the pain referable to the joints, and the non-inflammatory exudation into the joints occasionally noted. The diagnosis is difficult, as the eruptions cannot be distinguished from that due to copaiba, and it is liable to be confounded with scarlet fever, measles, or even smallpox. It may also be mistaken for syphilis, but the glandular engorgement is acute and painful, whereas in syphilis it is indolent.

OBSTETRICS.

UNDER THE CHARGE OF

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PASSAGE OF FOREIGN SUBSTANCES THROUGH THE PLACENTA.

PORAK (*Nouvelles Archives d'Obstétrique et de Gynécologie*, 1894, No. 3) concludes his researches on the above subject as follows:

1. The rôle of the placenta as an organ of accumulation of poisons. It is by its intermediation that poison is transmitted to the fœtus; it constitutes the organ of material changes between mother and fœtus. It plays the part of the lung, of the intestine and of the kidney, and in accumulating poisons its function approaches that of the liver.

2. Differences in the accumulation of poisons in the mother and fœtus. Mercury showed great affinity for the placenta. Lead and copper accumulated most in the fœtus, while arsenic was found chiefly in the liver of the mother and in the skin of the fœtus.

3. *Abortion.* The dead births and poly-mortality of the young following the intoxication. These are explained by the accumulation of poisons in the placenta and nerve centres. With copper and lead, abortion was not observed, but death of the young before birth was common, or else the mother died undelivered. Mercury has the power of producing abortion. Lead intoxication displayed itself in the young by producing cerebral lesions and paralysis. Arsenic produced abortions from placental hemorrhages.

4. Nosological consequences of poisoning in the fœtus. It is important to note that if the placenta is frequently and gravely attacked by syphilis, it is at the same time the elective organ of accumulation of mercury. The accumulation of lead in the cerebral nervous system of the fœtus accounts for the gravity of saturnine encephalopathic accidents. The presence of arsenic in the skin of the fœtus only, explains its therapeutic action in cutaneous diseases.

A New Method of Producing Premature Labor.

Boissard (*Répertoire Universel d'Obstétrique et de Gynécologie*, 1894, No. 4), at a meeting of the Société Obstétricale et Gynécologique de Paris, presented a new method of producing premature accouchement by means of an instrument which is described as follows: The instrument is composed of an aluminium tube of some grammes weight; twenty-five centimetres long, the end drawn out and shaped to a flute mouth. This portion is intended to be introduced into the uterus. Its exterior is curved and has a ring six centimetres from the end, which gives the measure of its introduction into the cervical canal; when this touches the os externum, the *bec de flute* is in the uterine cavity. In this conducting tube is placed a caoutchouc tube with an ovoid ampullar extremity, thin and very dilatable. To use the instrument the rubber tube is covered with vaseline and is placed inside the metal, projecting a little beyond the flute-like end. The instrument is passed by the left hand into the vagina and the flute-like end into the cervical canal until the ring rests against the external os. The rubber-tube is then injected, and, as it fills, the ovoid end protrudes and gradually makes its way upward to the internal os. The metal tube is then withdrawn, the rubber balloon being left in place. He claims an infantile mortality of 8 per cent., with absence of complications on the part of the mother. No change in fœtal presentations has been observed.

Symphysiotomy.

Morisani (*Annales de Gynécologie*, April, 1894) contributes an article on symphysiotomy, and comes to the following conclusions regarding the operation:

1. This operation is perfectly justified both in theory and practice. By it a fœtus at term, fully developed, can traverse a pelvis narrowed between the limits of 67–88 mm.

2. If the fœtus be dead or its vitality gravely compromised, this operation is bad.

3. Usually symphysiotomy should be performed at term, when labor has begun and dilatation advanced. Its association with premature labor should not be accepted, though occasionally it may be conjoined with embryotomy, when the child is dead.

4. The operation itself is simple; it is indifferent whether Galbiati's knife or a simple probe-pointed bistoury be used, or whether the articulation be opened from above or below, provided the suprapubic ligament be cut.

5. The movability of the sacro-iliac joint must be assured.

6. In a pelvis of 81 mm. or more, before cutting the articulation, tentative and cautious efforts should be made with the forceps.

7. The forceps is useful after the section in the great majority of cases, but is not indispensable.

8. Osseous sutures and immobilizing apparatus are not necessary. Suture of the soft parts and a restraining bandage are enough. It is a grave error to interpose foreign bodies between the lips of the wound.

9. This operation merits comparison with embryotomy when the fœtus is alive, and should be preferred to the latter. It is destined to replace Cæsarean section of choice.

10. It may be discussed in such cases, whether it be better to practise premature delivery in the early weeks of the ninth month, or wait the end of pregnancy and perform symphysiotomy. At a period less advanced than this, symphysiotomy at term merits the preference.

11. Ischio-pubeotomy constitutes a valuable resource in contractions due to ankylosis of one of the sacro-iliac symphyses.

12. The asserted evil results of pubic section are only observed where it is practised in cases outside its limits, and have for cause: *a*. The time of the labor during which it is done. *b*. The manner in which it is done. *c*. The pre-existent lesions of the genitalia. *d*. Special conditions of the patient. The death of the fœtus is to be ascribed: *a*. To a tardy intervention. *b*. To accidental circumstances. *c*. To accessory means used in extraction.

Symphysiotomy and Cæsarean Section for the Relative Indications.

Davis (*The Medical News*, 1894, No. 15) reports two cases of symphysiotomy and one of the Sänger-Cæsarean operation, with conclusions drawn from the study of those cases. The first patient was a II-gravida with pelvic measurements as follows: Anterior superior spines, 24 cm.; crests, 25 cm.; transverse 24.5 cm.; external conjugate, 16 cm.; internal conjugate, by measurement, 7.25 cm. Labor began on December 22, 1893, uterine contractions being regular and fairly strong. As the labor progressed, the membranes ruptured, but dilatation was slow and engagement of the presenting head would not take place. As all efforts at engagement, including dilatation of the cervix by means of Barnes' bags, had failed, symphysiotomy was performed. The incision was made above the pubes, terminating three-quarters of an inch above the joint, thus leaving an unbroken cutaneous surface directly over the symphysis. The pubes separated three-quarters of an inch after section. Delivery was accomplished by Tarnier's axis-traction forceps without laceration of the perineum or surrounding soft parts. The child, a male, well developed, lived. A strand of iodoform gauze was carried behind the symphysis to prevent the bladder and adjoining tissues from being pinched when the parts of the symphysis were brought together. The wound was closed in the usual manner, an open stitch being left at the lower end—this stitch being tied when the gauze was removed. Fixation of the pelvis was accomplished by a broad strip of adhesive plaster passed around the trochanters. The mother made a good recovery, and was kept under observa-

tion at the Jefferson Maternity, Philadelphia, for some months after operation. No movement could be detected in the joint. The patient after her recovery was fully able to do domestic work of all kinds. A measurement of the pelvis taken after recovery showed a slight increase of 0.5 cm. between trochanters, 1 cm. in the external conjugate, and 0.75 cm. in the internal conjugate.

The second symphysiotomy was done on a young primipara of poor development and unstable nervous system, who was between the seventh and eighth months of pregnancy. Urine showed albumin, a low percentage of urea, but no casts. Pelvic diameters were as follows: Anterior superior spines, 22.5 cm.; crests, 25 cm.; transverse, 27 cm.; external conjugate, 19 cm.; internal conjugate, 9.5 cm. Labor was induced for symptoms of immediate toxæmia. After a long first period of labor, the head not engaging, notwithstanding the use of Barnes' and McLean's dilators, symphysiotomy was performed by the same method as in the previous case. The child presented in the right occipito-posterior position and presentation, and was extracted by the use of Simpson's forceps with axis-traction tapes. No rotation of head occurred, the child being born in the original position without injury to pelvic floor. Both mother and child made a good recovery, the only complication being an eclamptic attack in the mother eighteen hours after delivery.

As a contrast to the foregoing, the author reports a case in which instead of symphysiotomy, the Sänger-Cæsarean section was necessary. Here the patient was an apparently perfectly developed woman, but who, although five times pregnant, had given birth to but one living child. Pelvic measurements were as follows: A. S. S., 28; Cr., 30; Tr., 29.5; E. C., 19.5 cm. The pelvis was funnel-shaped, the cavity narrowing very appreciably toward the outlet. The child presented by the breech. After consultation, the Cæsarean operation was chosen and performed, and a large female child weighing 11.75 pounds, and 52 cm. long, was safely delivered. The mother's convalescence, although complicated by a serious cough following grippe, and a small stitch abscess, was good. The author concludes that, in cases in which the fœtus is disproportionate in size to the mother's pelvis—and in which, after spontaneous efforts have failed to secure engagement of the presenting part, these efforts have been supplemented by a thorough examination under anæsthesia, and a fair trial to secure engagement by manipulation and suprapubic pressure—if the fœtus be living and in good condition, it is the duty of the physician to refrain from applying the forceps, and to deliver the patient either by symphysiotomy or the Cæsarean operation.

Melæna Neonatorum.

Gaertner (*Archiv für Gynäkologie*, 1893, B. xlv., H. 2), in an article on the above-named subject, concludes that it is an infectious disease, the mode of entrance and the course of the germ not being certain. He believes, however, that the navel is the entrance point. All observations made on cases, and researches on the lower animals, show that first a peritonitis comes, and to this are joined the intestinal affection, the bleeding, and the general infection of the body. Various cultures made from intestinal contents on agar and

gelatin plates or otherwise, with inoculation of the results into guinea-pigs and puppies, give identical results in the bodies of these after death, and the results were apparently those found in children dead from the disease in question. The bacillus showed motion around its transverse axis, and on gelatin, pin-headed spores sharply outlined with concentric rings could be seen. These were gas-producing and had lateral processes (whips), and can be distinguished from gas-forming bacilli, typhus bacilli, and the bacillus coli commune.

The Fimbrial Currents and Migration of the Ovum.

Heil (*Archiv für Gynäkologie*, 1894. B. xliii., H. 3) refers to the various views of many authors and his reasons for differing from many of them. He details the results of twelve experiments made by himself on rabbits. Having opened the peritoneal cavity, he injected a solution of sodium chloride containing powdered charcoal into the cavity. In some cases the injection was made into the whole cavity; in others into peritoneal pockets. In all experiments the results were similar. Minute particles in close proximity to the current of the cilia of the fimbriated end were swept into the infundibulum or into the tube. Corpuscles more remote were not affected. Ova, even if brought very near, remained immovable. In conclusion, the experimenter thinks that proof is wanting of a constantly acting fimbrial current able to move ova lying on the peritoneum to the abdominal mouth of the tube, and he doubts also if this can be certainly established experimentally. Many impulses are to be considered in the migration of the ova. If the fimbria embrace the follicle, the case is very simple. If the ova escape near it in the narrow space between the end of the tube, ovarian capillarity, aided by the escaping fluid from the follicle, may drive the ovum into the tube. If the ovum falls into the general peritoneal cavity, it is usually lost, unless by chance it drops within the reach of the cilia, or be floated thereto by the peritoneal serum.

Temperature Relations in the First Week of Life.

Feis (*Archiv für Gynäkologie*, 1894, B. xliii., H. 3) contributes the results of a series of observations on the relations of temperature during the first week of infantile life. On 25 children he made 2921 observations, using a maximal thermometer, in all cases the temperature being taken in the rectum, carefully avoiding the introduction of the instrument into any fecal mass. So far as possible the observations were made under similar circumstances. The thermometer was retained fifteen minutes. The temperature of both mother and child was taken at the same time. The tables show that the child's temperature exceeded the mother's by about 0.6° C., the sex of the child making little difference. Marked immaturity of the child seemed accompanied by a slightly lower temperature. Immediately after birth a rapid fall of from 0.86° C. to 1.7° C. takes place, chiefly through the skin; depending on the temperature of the outer air and also on the bath. Then comes a more or less rapid rise, till within about thirty-six hours the norm is reached. The amount of food absorbed by the child seems to have some influence on the temperature augmentation.

GYNECOLOGY.

UNDER THE CHARGE OF

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The Treatment of Pelvic Abscess.

Landau (*Archiv für Gynäkologie*, Bd. xlvi., Heft 3) concludes an extended article on this subject with the following *résumé:* A unilocular abscess pointing in the vagina should be incised through the posterior fornix; if it is also prominent through the abdominal wall, evacuation of the pus through simultaneous external and internal incisions will hasten a cure, though a counter-opening for this purpose is seldom necessary. It makes no difference whether the abscess thus treated is intra- or extra-peritoneal, so long as it consists of a single cavity.

In the case of a recurrent *multilocular* abscess, as in unilateral pyosalpinx, extirpation by cœliotomy is alone indicated, but if after opening the abdomen the collection of pus is found to be extra-peritoneal, it is better to evacuate the latter per vaginam. In cases of double unilocular abscesses vaginal incision and drainage should be practised, since in this way the functions of the tubes and ovaries may be preserved, while a radical operation can be performed just as well subsequently if desired. Multilocular abscesses involving both tubes, simple or complicated with extra-peritoneal pus-collections, may be removed by cœliotomy, but a better prospect of effecting a radical cure is offered by vaginal extirpation of the uterus with the adnexa. This is best effected by morcellation and the use of clamps. Péan and Segond's recommendation to secure drainage by the removal of the uterus alone, in complicated cases in which the pus sacs cannot be extirpated per vaginam, does not appear rational. Under these circumstances it is better to remove as much as possible from below, and the rest of the diseased tissues through an abdominal incision. In case of doubt as to the existence of bilateral suppurative disease, explorative cœliotomy is first indicated. In other cases, even when it seems doubtful if the affected organs can be entirely removed per vaginam, the attempt should first be made from below, except where examination has shown that the pus tubes are situated high up in the pelvic cavity; under the latter circumstances adhesions should be broken up and the adnexa removed by cœliotomy, after which the uterus should, in every case, be extirpated per vaginam on account of the far greater relative safety of this procedure. Experience has shown that those cases do better in which combined drainage is used, a glass tube being left in the abdominal wound for three or four days.

The favorable results of the vaginal operation, remote as well as immediate, in complicated cases of pelvic suppuration, justify us in applying it to simple cases also in which the adnexa are removed without the uterus.

More care should be exercised in determining before operation whether suppuration is uni- or bilateral, since it may be possible to resort successfully to less heroic measures if this point is positively settled beforehand. It is greatly to be desired that, in publishing statistics, gynecologists should state more precisely in citing cases of pelvic suppuration, the origin of the abscess, whether intra- or extra-peritoneal.

Varicocele of the Recto-vaginal Septum.

Chéron (*Revue Méd.-Chir. des Maladies des Femmes*, 1894, No. 1) describes under this term a varicose condition of the veins in the recto-vaginal septum, recognized as a hard, sensitive, elongated swelling, which may extend from the posterior fornix as far down as the lower third of the vagina. It is often associated with hemorrhoids, both being due to obstruction of the intra-pelvic veins, caused by various affections. Lumbar neuralgia is one of the accompanying symptoms. Aside from the removal of the cause, the writer advises massage of the swelling and steady pressure exerted from below upwards.

Vaginal Hysterectomy for Procidentia.

Savage, in a recent discussion on this subject at the British Gynecological Society (*Brit. Gyn. Journ.*, 1894, No. 2), approved the operation in intractable cases of complete procidentia occurring in patients after the menopause. He made the surprising statement that the operation was attended with much less risk than was either ventro-fixation or shortening of the round ligaments, which was severely criticised by Fenton and Bantock. The former believed that ventro-fixation was applicable to all such cases, while the latter stated that in an experience of thirty years he had never met with a case of prolapsus in which perineorrhaphy and the use of a Hodge pessary were not sufficient to correct the displacement (!)

[Comparison of this discussion with one on the same subject at a recent meeting of the New York Obstetrical Society shows that English, as well as American, gynecologists find it difficult to modify their long-cherished views in accordance with the progress of modern surgery.—Ed.]

Terminations of Nerves in the Female Genital Organs.

Köstlin (*Fortschritte der Medicin*, 1894, No. 11), from extended microscopical observations in the lower animals, as well as in the human subject, arrives at these conclusions: In the Fallopian tubes of sheep there are but few nerves in the mucosa and no plexuses. The nerve fibres are either distributed directly to the epithelium or first enter the extremities of the mucous folds and then terminate in the cells; their ultimate terminations in the epithelia were not demonstrated. Triangular ganglion-cells are found in considerable numbers in the mucosa, from which extend many fibres thicker than the other ones and not so tortuous, which sometimes anastomose with other neighboring processes and can be traced directly to the epithelia. In the tubal mucosa of pigs there is a rich anastomosis of nerve fibres, with finer branches, which can be followed into the epithelial cells, though it is impossi-

ble to discover their ultimate terminations. In the uteri of rabbits intricate plexuses exist in the endometrium, their fibrillæ terminating either directly in the epithelia or in end-bulbs. In guinea-pigs, fibres can also be traced into the glands, where they end between the cells. Numerous ganglion-cells with interlacing processes are also seen, especially in calves, in which animals spindle-shaped cells are found with numerous interlacing processes, which may belong to the nervous system, though this is doubtful. The same cells are seen in the endometrium in sheep.

Ovariotomy during Pregnancy.

Gordon (*Centralblatt für Gynäkologie*, 1894, No. 23) reports five successful cases from Lebedeff's clinic, three of the patients aborting (one on the fifth and two on the fifteenth day after the operation), while in the other two pregnancy was not interrupted. He collected two hundred and four cases, in twenty-one of which it was not stated whether the pregnancy was interrupted or not. In seven the uterus was injured, two patients succumbing. Of the others, 93.2 per cent. recovered, and 6.8 per cent. died; 22 per cent. aborted, while in 69.4 per cent. delivery occurred at full term. The total mortality was only 3 per cent., while in 78 per cent. of all the cases the pregnancy was not interrupted.

The Treatment of Anteflexion by Hysteropexy.

Condamin (*Le Mercredi Médical*, 1894, No. 20) states that Laroyenne, finding the ordinary surgical methods of treating anteflexion unsatisfactory, has resorted to ventro-fixation, which causes a permanent straightening of the flexion with an entire relief of the symptoms to which its gives rise. Though temporary benefit is obtained by divulsion, the obstruction sooner or later returns, since it is impossible that the weight of the fundus uteri plus the intra-abdominal pressure should not cause a persistence of the angle of flexion. In fixing the uterus it is necessary to exercise some care to select a point somewhat high up on the abdominal wall in order to exert traction on the vagina and thus to keep the cervix straight. While pregnancy is undoubtedly rendered possible by the operation, it cannot be denied that it may be influenced unfavorably by the fixation. Two cases are reported in which dysmenorrhœa was thus entirely relieved.

Surgical Treatment of Vaginismus.

Pozzi (*Ibid.*) performed the following operation in the case of a patient whose hymen remained intact and extremely sensitive eight years after marriage: The hymen was first incised with scissors and the vulva was forcibly dilated with an anal speculum. Then a lateral incision about one and one-half inches long was made from right to left at the junction of the lower and middle thirds of the vulvar orifice, extending a little below the line of insertion of the hymen and forming a cross with it. The fibres of the constrictor cunni were exposed and their superficial bundles were divided. The flaps were then dissected up, forming an elongated lozenge-shaped wound with its long axis parallel with the edge of vulva. This was closed with silkworm-gut

sutures in such a manner that the line was at right angles with the original incision. By performing this operation on both sides the result is practically the same as in a double Tait's flap-splitting perineorrhaphy. The vulva is enlarged and the mucous membrane of the vagina is rolled out in such a way as to sustain during coitus the mechanical friction which originally gave rise to reflex symptoms. The operation is applicable to all cases of vaginismus due to hyperæsthesia and contraction of the vulva, but is contra-indicated when the spasm is a reflex one, symptomatic of a more remote genital affection.

Intra-uterine Cauterization.

Sänger (*Centralblatt für Gynäkologie*, 1894, No. 25) in a paper on this subject, read before the Leipzig Obstetrical Society, criticises sharply the generally accepted view that gauze when introduced into the uterine cavity acts as a drain. He believes that when the os is not stenosed the uterus drains itself, artificial drains simply acting to plug the canal and prevent the escape of the accumulated blood. The gauze only permits the discharge of a thin, watery secretion, but not the escape of purulent or viscid material and coagulated blood. There is neither disinfection of the uterine cavity, as Abel maintains, nor the establishment of permanent drainage, as claimed by Skutsch. It is only after the removal of the gauze that there is an escape of the retained secretion. The rise of temperature often noted is an indication of this retention. The expression "gauze drainage" is incorrect; it should be "gauze tamponade." The gauze simply dilates the cervical canal and sets up uterine contractions, thereby increasing the circulation in the uterus. After its removal drainage is better because the canal is more patent. There is no medicinal effect from the iodoform. The writer has had better results from the use of gauze saturated with a solution of chloride of zinc; in fact, he uses the gauze tamponade merely as a preliminary to cauterization of the endometrium. The real action of intra-uterine caustics has been generally misunderstood. Gynecologists do not allow sufficient time for the caustic to act, but repeat the application at frequent intervals, without waiting for the slough to separate; hence frequently arise cicatricial stenosis and other bad results. Again, weak solutions are ordinarily used, such as tincture of iodine, acetic acid, dilute carbolic acid, and liquor ferri sesquichlor., which not only do no good, but, when frequently applied, often cause violent irritation and increase the local pain.

The writer's practice is to apply strong caustics at long intervals; fifty per cent. chloride of zinc, introduced on cotton (wound around a silver probe) being suitable in all forms of endometritis. A narrow cervix, such as is often present in virgins or nulliparæ, is a contra-indication. In this condition the writer first uses, experimentally, a weak solution of zinc (ten per cent.) or tincture of iodine. The strong solution is applied at intervals of from sixteen to twenty days, two or three such applications being sufficient to cure a case of ordinary catarrhal endometritis. Erosions of the cervix he formerly touched with fuming nitric acid every three weeks, but now uses instead the strong solution of chloride of zinc. The thermo-cautery is the ideal aseptic caustic in the treatment of erosions. The writer, of course, places curettage before intra-uterine cauterization as a means of treating endometritis.

In the discussion of this paper, ZWEIFEL agreed with the reader that gauze did not really drain the uterine cavity. He had abandoned the use of iodoform gauze as a vaginal tampon in cases of hemorrhage, preferring to use pledgets of cotton saturated with acetate of aluminium. Gauze introduced into the uterus checks hemorrhage, but only in the same way as any foreign body, *i. e.*, by causing contraction of the organ. He was inclined to go still farther and to affirm that gauze when introduced into the peritoneal cavity acts purely as a tampon and not as a drain.

DÖDERLEIN expressed the same opinion with regard to the inefficiency of so-called uterine gauze drainage. He was opposed to the common practice of applying a caustic to the raw surface left after curettage. Iodoform gauze has no medicinal action within the uterus; the iodoform is simply mingled with the blood-clot and is not absorbed at all.

[We are glad to receive such weighty support of an opinion which we have held for some time, in spite of our habitual use of the gauze drain after curettage. Notwithstanding the emphatic commendation of this practice by eminent American gynecologists, we have long been in doubt as to the amount of drainage secured by tamponade of the non-puerperal uterus, even after the cervix has been thoroughly dilated. In our experience not only has a frequent slight rise of temperature during the first twenty-four hours after operation indicated retention of secretions, but drainage has only been free *after removal* of the gauze. Sänger's well-known iconoclastic tendency is supported by so much native keenness and common sense that we cannot afford to treat lightly his criticism of this generally-accepted practice.—ED.]

SURGICAL TREATMENT OF FIBROMYOMA OF THE UTERUS.

THIS subject continues to excite the keenest interest among abdominal surgeons here and abroad, as shown by the prominence assigned to it in recent society discussions. Not to speak of the papers read before our own societies during the past three or four months, the following have appeared in foreign journals:

LEOPOLD (*Centralblatt für Gynäkologie*, 1894, No. 26) reports twenty operations with one accidental death at the end of the third week, due to pulmonary embolus. He claims for his method of intra-peritoneal treatment of the stump that it reduces the loss of blood to a minimum, shortens the operation, and thus eliminates the element of shock. In one hundred and sixty operations for fibromyoma performed since 1889 by all methods (including forty-six cases of enucleation per vaginam and forty of castration), his mortality was only 2 5 per cent. In twenty-four cases of total vaginal extirpation of the fibroid uterus there was no death, while the total mortality in ninety abdominal operations was only 4.4 per cent. The writer's present technique in supra-vaginal amputation is as follows: After delivering the tumor the upper part of the incision is closed. The broad ligaments are ligated with silk, the uterine arteries and veins being tied *en masse* when the stump is small, without securing the latter with an elastic cord. If, by reason of the unfavorable conditions, it is impossible to isolate the uterine arteries, the base of the tumor is surrounded with a rubber cord, the capsule is split, and the growth partially enucleated. The peritoneum is then dissected off as low as the cord, *i. e.*, to the point of attachment of the bladder, the tumor

is removed, and the stump trimmed down as much as possible, the vessels being at the same time ligated at about the level of the os internum, and the ligatures cut short. The cervical canal is cauterized, then the stump is transfixed and ligated in two portions with stout silk ligatures, which are also cut. The peritoneal flaps are carefully sutured over the stump with fine silk, including a portion of the subjacent cervical tissue, all pockets around the uterus having been previously covered over with peritoneum. The abdomen is then closed without drainage.

DEMETRIUS (*Ibid.*) describes a somewhat similar operation which, in his hands, was attended with a mortality of only 4.3 per cent. in twenty-four cases. He curettes the uterus and cauterizes the cervical canal as a preliminary step. In ligating the uterine arteries a portion of the uterine tissue is purposely included on either side, which not only serves as an efficient safeguard against hemorrhage, but renders the elastic cord superfluous. If there is much bleeding from the stump it is transfixed on both sides, the ligatures being passed through the tissue just outside of the cervical canal from before backward. If the stump is large other ligatures may be used, but as none of these encroach upon the canal, it is left open for drainage, which is favored by the introducion of a strip of gauze. The raw surfaces are not covered with gauze. The peritoneal folds are simply allowed to fall together without being sutured.

The same writer thus summarizes with regard to the treatment of fibromyoma: All methods of treatment, including Apostoli's, which do not aim at the actual removal of the growth are to be regarded as simply palliative. Castration is an uncertain measure, has only a limited application, and is opposed to the essential principles of conservative surgery, since the healthy (?) ovaries are sacrificed. Progressive increase of existing symptoms is an indication for removal of the tumor; palliative treatment under these circumstances simply aggravates the trouble and affects unfavorably the prognosis of the radical operation, hence the latter should be elected early. Vaginal extirpation of the myomatous uterus, when possible, is preferable to the abdominal method. Supra-vaginal amputation gives better results than total abdominal extirpation, and the intra-peritoneal method of treating the stump is preferable to the extra-peritoneal. There is no reason why the mortality of supra-vaginal amputation should not be as low as that of ovariotomy.

THE CAUSE OF PAIN IN UTERINE FIBROMYOMA.

QUÉNU (*Gaz. Méd. de Paris*, 1893, No. 48) attributes the pain in fibromyoma to several factors, chief among which is pressure of the tumor upon the sacral plexus, especially if it is impacted in the pelvis, or upon the lumbar plexus when it extends upward into the abdominal cavity, or is freely movable. Severe pains are also referable to pressure of the tumor upon the ovary, when the latter is healthy. Irritation of the peritoneum, especially in Douglas's pouch, may cause pain, even when there is no peritonitis. Inflammation of the growth itself, of its serous covering, and of the tubes and ovaries, are also important factors. Retention of blood within the uterine cavity and infection of the same may readily lead to inflammatory conditions in the tumor, on account of the rich vascular supply of the endometrium and its intimate relation to the fibro-muscular tissue in the broad ligament.

PÆDIATRICS.

UNDER THE CHARGE OF

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ASSISTED BY

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ON SCARLATINA-LIKE RASHES IN CHILDREN.

ASHBY, of Manchester (*Medical Chronicle*, June, 1894, p. 161) publishes a thoughtful paper under this title. In spite of the well-marked characteristics of scarlatina, he remarks, the difficulties of diagnosis and the perplexities to which they give rise are well known. Scarlet fever may be a practically feverless disease, the temperature not exceeding 99.5° or 100° F. for a couple of evenings; the fauces may be only doubtfully reddened; there may be an absence of the yellow spots on the tonsils, so often present; and the whole diagnosis, as far as scarlet fever is concerned, may turn on the character of the red rash. At other times a well-marked red rash makes its appearance in the course of some other disease, like pneumonia, or after an operation, or during suppuration of some sort, and much difficulty may be experienced in determining whether scarlet fever is present as a complication or not. The author has seen cases which, during an epidemic of influenza, resembled in their general symptoms this protean disease, and yet were accompanied by a rash closely resembling scarlet fever. This association of influenza with a red rash has been noticed by Kramsztyk, who records many cases in a recent epidemic of influenza in Warsaw, and appears to have no doubt that these cases were quite distinct from any scarlatinal infection. On the other hand, Filippow records sixteen cases in which influenza was complicated with scarlatina in a mild form.

The disease which at times most closely resembles mild scarlatina is the scarlatina form of rubella. This disease, as is well known, usually resembles measles rather than scarlet fever, and sometimes very closely. Whether there are really two distinct diseases included under the name of rubella which do not protect from one another, or whether there is only one disease which is modified by influences of which we are ignorant, so as at one time to resemble measles and at another time to resemble scarlet fever, it is at present impossible to say.

In the author's experience some years ago an epidemic of this form of rubella was at first considered to be mild scarlatina until the first cases admitted to the Children's Hospital and sent to the scarlatina ward promptly developed scarlet fever while the first rash was fading. In the primary disease there was an absence for the most part of vomiting; the fever was only slight; a sore-throat was mostly complained of, and there was slight tonsillitis to be seen on examining the fauces. The rash was general, bright red, and

punctiform, exactly resembling that of a mild case of scarlet fever. Similar epidemics have been described by Filatow and Kramsztyk. In two of the cases described by the latter there had been previous attacks of scarlet fever attended by himself; one later had a typical attack of the ordinary type of rötheln, and another true measles. The attacks began suddenly with fever, headache, and sometimes vomiting, with a red rash. The fever, which ranged from 101° to 103°, lasted from two to four days, and the rash about the same time. The rash was general except on the face, and indistinguishable from scarlet fever; there was hardly any tonsillitis. The headache and malaise usually lasted only one day, and so by the second or third the child was practically well but the rash remained visible. In one case there was swelling of the cervical glands.

Desquamation is mostly absent. Difficulty in diagnosis principally occurs in isolated cases, or in the first case or two coming under notice. When other cases occur the long period of incubation of rubella would be a valuable aid. The author raises the question whether rubella, when it assumes the scarlatinal type, has a shorter incubation than in the other form.

Surgical scarlatina, he believes, is in most cases scarlatina occurring in a subject under the care of a surgeon, but in cases in which there is an excessive amount of suppuration there may be a red rash due to septicæmia. It occurs in cases of scarlet fever where there is much suppuration about the neck and fauces, the rash looking at first sight like a second scarlet eruption, but it is apt to be more patchy and of a duskier hue. A similar rash may be seen in empyema with much pus-formation. The rash seen in severe cases of diphtheria is no doubt also septic, though it is now a well-recognized fact that a membranous exudation exactly resembling true diphtheria may be present on the fauces in scarlet fever, but the Loeffler bacillus is absent. The inflammatory form of diphtheria is sometimes exceedingly like scarlet fever, beginning with vomiting and high fever; especially if there were a dusky septic rash present the likeness would be still more close.

Among the drugs, belladonna is the only one that produces an erythema liable to be mistaken for scarlet fever. Antipyrine certainly at times produces a rash, but it is more of the measles or nettlerash type.

The question of desquamation, which is apt to follow all diffuse rashes, especially where there has been fever, is of great importance. The author believes that as indisputable evidence of scarlatina desquamation is greatly overrated. Mild cases of scarlatina often do not desquamate at all, or differ in no way from other febrile attacks, such as influenza, pneumonia, or typhoid.

Treatment of Double Empyema in Children.

G. A. Sutherland (*Lancet*, June 9, 1894, p. 1439) reports four cases of this interesting and rather rare affection, and tabulates the leading facts in 17 cases collected from the literature. As regards etiology, 14 (67 per cent.) were secondary to lobar pneumonia, one was preceded by influenza, one by broncho-pneumonia, two are described as primary, and in three the history of previous illness is indefinite. This corresponds very closely with the statistics of unilateral empyema given by Adam (*Archiv f. Kinderheilk.*, Bd. xv., Hefte 5 u. 6), who found that in 32 cases, 23 (71 per cent.) were preceded by lobar

pneumonia. In the four cases reported by the author, occurring in children from two and a half to six years of age, the treatment adopted was double resection, irrigation, and drainage. After resection the pleural cavity was explored with the finger to break up adhesions and estimate the size of the cavity, and a short drainage-tube inserted, which was removed usually within a week. To this practice of temporary drainage he attributes the rapid recovery, the average duration of drainage in his four cases being seven days, as contrasted with seven weeks in the other cases published. This fact has especial bearing on the treatment of cases of double empyema, where, if one side is speedily cured, the other can then be treated without danger in the same radical manner, aspiration having been performed, if necessary, in the meantime. This would seem to be the most satisfactory method, for in the reported cases of "simultaneous drainage" the collapse has frequently been alarming, and the signs of cardiac and respiratory embarrassment very marked. As regards the side to be operated on first, the greatest relief will probably be obtained by selecting the side on which there appears to be the larger amount of fluid. After the operation-wounds have healed, an important part of the treatment is the employment of forced respiratory movements and chest-expanding exercises.

A Case of Paralysis following Diphtheria of the Genitals Only.

W. Gayton (*Lancet*, May 26, 1894, p. 1301) reports a case of purely genital diphtheria in a girl of four years, who was admitted to the Northwestern Fever Hospital. The skin of the groins, labia, and vulva was excoriated from a very offensive, copious vaginal discharge. On separating the genitals the parts were found to be extremely swollen and covered with a membranous exudate of true diphtheritic character, which had also crept along the vagina as far as could be seen. The temperature was 96°, the countenance very pallid, and the pulse feeble and slow. The vulvitis had existed for a fortnight, but the throat was not, nor had it been previously, affected.

Twenty-two days later, under tonic treatment, together with local use of a perchloride of mercury solution, the parts were nearly healed and the vaginal discharge had ceased; but the urine still continued slightly albuminous, and the temperature and pulse subnormal. Four days later marked strabismus was observed, also palate paralysis, with regurgitation of fluids through the nostrils and an irritating, noiseless cough. In three days more the muscles of visual accommodation were impaired and the paralysis continued to increase until, ten days later, death occurred, apparently from direct toxic action of the diphtheritic poison on the bulbar centres. The chief point in view in recording the case, the author says, is to qualify a statement recently made, that diphtheritic paralysis does not follow except when the fauces have been previously affected.

A Case of Urticaria produced by Santonin.

G. Stewart Abram (*Lancet*, May 12, 1894, p. 1186) relates the following case: A child seven years of age was brought to him suffering from threadworms, which had been present for three years. She had been under treatment once before for this cause, but had not taken santonin. The child was

rather pale and flabby and had a slight cough. Santonin powders of three grains each were ordered to be taken fasting on alternate mornings for three days, preceded on the previous night by castor oil and followed by a similar dose. She had a dose of castor oil on the night of April 21st and her first powder at 7 A.M. on the 22d. On this occasion the only sign of any eruption was a red œdematous patch the size of a five-shilling piece on the left forearm, which was rather irritable and was ascribed by the mother to an insect bite. On the 24th she had the second powder at 7 A.M., and by 8 A.M. the face was red and puffy, and in a short time the whole body and the limbs were œdematous and covered with a typical urticarial eruption, consisting of large white wheals surrounded by a broad, red areola. There was some irritation, but it was not at all intense, and by 11 A.M. the rash had almost entirely disappeared. To verify the cause the third powder was given at 7.20 A.M. on the following day, and in an hour a similar rash, if anything more intense, had appeared. The bowels were freely opened about 9 A.M., and the rash had entirely gone by 10 A.M.

Sieveking (*Brit. Med. Journ.*, February 18, 1871) mentions a similar example, and Morrow, in his work on drug eruptions, quotes a number of cases recorded by Hubert, in which the administration of santoninate of soda was followed by an eruption of pin-sized vesicles on the trunk and limbs. It appears, therefore, that the santonin idiosyncrasy is rare, and that the eruption may vary in character, is accompanied by little or no constitutional disturbance, and rapidly disappears, leaving no ill-effects.

The Starting-points of Tuberculous Disease in Children.

J. Walter Carr (*Lancet*, May 12, 1894, p. 1177) presents an interesting paper under this title founded upon the records of 120 necropsies made at the Victoria Hospital, Chelsea, upon children suffering from tuberculous lesions, in no less than 82 of which the disease was more or less generalized. The most important general conclusions are these: 1. That tuberculous disease in children commences usually in the glands, the liability being at its maximum during infancy and early childhood, and rapidly decreasing in later childhood. That caseous glands, especially the internal ones, may (*a*) remain quiescent for an indefinite period; (*b*) start tuberculous mischief in adjacent parts, especially the lungs, by direct extension; and (*c*) set up general miliary tuberculosis. 2. That the internal glands, at any rate, are probably most often infected directly from the organ with which they are connected, although the possibility of infection through the blood-stream must not be forgotten. 3. That tuberculous disease starts much more frequently in the thorax than in the abdomen, and certainly far more often in the thoracic than in the mesenteric glands. This does not throw any doubt upon milk as a possible source of tuberculous disease, but this does not seem to be by any means a frequent mode of infection as compared with that through the lungs. At the same time the importance attached by Dr. Woodhead, on the basis of his statistics, to the mesenteric glands, indicates the necessity of a further and prolonged investigation of the pathological evidence, not in one place only, but in all parts of the country—for the conditions producing tuberculous disease may vary materially in different localities. 4. That glandular

disease may often exist alone and quite unsuspected; in very many cases, doubtless, it is quite impossible of diagnosis. 5. But, after all, by far the most important treatment is the prophylactic. Whether the glands get infected directly through the lymphatic channels or indirectly through the blood-stream, the organisms must in every case have passed in through the mucous membrane, and through a healthy one they probably cannot penetrate. We have, therefore, to try to prevent gastro-intestinal and respiratory catarrhs, and especially to avoid their becoming chronic; to deal promptly with, and if possible to prevent, rickets, the great cause of such catarrhs in early childhood; and to take especial care of children during convalescence from measles, whooping-cough, and other acute specific diseases, so liable to depress the vitality of the body generally, and the resistant power of the mucous membranes, as well as the filtering power of the glands, in particular.

Primary Sarcoma of the Supra-renal Capsule in an Infant.

Cohn (*Berliner klinische Wochenschrift*, 1894, No. 11, p. 257) reports an interesting case of the kind in a girl of nine months. She was brought to the clinic for a tumor of the right temporal region with exophthalmos of the right globe. Examination showed a diffuse tumor of the temporal region limited in front by the external margin of the orbit and behind by the ear. The mass was adherent to the underlying tissue and was covered by movable but highly vascularized skin. Some similar nodules were found behind the ear and upon the vertex. The right eye was very prominent. The liver was considerably enlarged, and a little below it, but not connected with it, was a round tumor. The spleen was also slightly enlarged.

The diagnosis was neoplasm of the kidney with multiple metastases. During the three weeks following, the tumor of the temporal region grew very rapidly and invaded the nasal fossæ and the palate; the abdominal tumor had increased posteriorly and become prominent in the lumbar region.

At the autopsy a medullary sarcoma of the right supra-renal capsule was found, with metastases in the liver, the kidneys, and the ribs at the costo-chondral junctions.

A Peculiar Syndrome in Tuberculous Children.

Weill (*Lyon Médical*, 1894, Nos. 20 and 21, p. 77) calls attention to a peculiar association of symptoms which he has observed in several cases of pulmonary tuberculosis in children. This is characterized by cyanosis of the face and extremities, a sensation of coldness coincident with a notable depression of the central and peripheral temperature, arterial spasm, increase in the number of red corpuscles in the cyanotic areas, increase in the size of the spleen, and transitory albuminuria. This syndrome is produced simply by a change of posture from the recumbent to the standing, or by passage from a warm temperature to a moderate or a cool temperature. The phenomenon is transitory, its duration varying from several minutes to several hours. It has an intermittent course, being produced very easily at certain periods and not showing itself at others. It appears to be independent of the clinical aspect of the pulmonary tuberculosis, of the predominance of any symptom,

or of the extent and gravity of the lesions. It appears at the beginning of tuberculization as well as at an advanced period, and it is independent of *régime* and of season.

PATHOLOGY AND BACTERIOLOGY.

UNDER THE CHARGE OF

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Embolism of the Abdominal Aorta.

Matignon, in an article in *La Médecine Moderne* (26 Mai, 1894) reviews our present knowledge of this rare condition. He finds in the literature twenty-five cases, upon which his conclusions are based. Of these, twelve occurred in men. No case occurred before the twentieth year. In the majority of the cases the embolism occurred in connection with an infectious disease, usually associated with an endocardial lesion. Thus, in six cases it followed acute articular rheumatism; in five cases puerperal pyæmia; in four erysipelas; once each, typhoid fever, pneumonia, syphilis. In four cases there were endocardial lesions of indeterminate character. Usually emboli are found in various parts of the body in cases of fatal embolism of the aorta. The usual seat of the embolus is the bifurcation of the vessel, and it may occlude one or both of the common iliacs completely or partially. The symptoms vary somewhat in different cases, depending chiefly upon the degree of occlusion of the vessel. Their onset is sudden, and the most constant are violent pains in the lower extremities, paraplegia, cessation of pulsation in the arteries of the lower limbs, lower temperature of the legs, and rapid trophic change resulting in gangrene. The prognosis is very grave, twenty-three of the twenty-five cases described having died, usually within four days after the onset of symptoms. For such a condition treatment could hardly be expected to be of much avail.

Dysentery and Abscess of the Liver.

In the autumn of 1892 Kruse and Pasquale visited Egypt for the purpose of studying the dysentery there prevalent, more particularly as it bears upon the so-called tropical abscess of the liver. The results of their investigation are set forth at length in an exhaustive article in the *Zeitschrift für Hygiene und Infektionskrankheiten* (1894, xvi. pp. 1-148).

After a review of the work already done as regards the etiology of dysentery they describe the monads and amœbæ which are frequently present in the intestine of the Egyptians during health, and to which no pathogenic qualities attach. The amœbæ thus found by Kruse and Pasquale do not differ morphologically from those found associated with dysentery. The relation-

ship of the amœba coli to one of the forms of dysentery has been so clearly demonstrated by Kartulis and by Councilman and Lafleur that it is not strange that Kruse and Pasquale should have first directed their attention to it. Fifty cases of amœbic dysentery were studied. In forty of these the amœbæ were found in the stools. In every case examined post-mortem they were found in large number in the ulcers. In all, twenty-six cases, including cases of abscess of the liver, came to autopsy. These were subjected to careful bacteriological examination, as were also about two hundred dysenteric stools, with the result of finding bacteria of several species in all, but none constantly or under such conditions as to make apparent any etiological relationship between the disease and their presence.

As regards the pathological anatomy of the lesions of amœbic dysentery the following may be said: The lesion is essentially a catarrh of the mucous membrane of the colon, which later becomes ulcerative as the result of necrosis. The site of the first structural changes is the submucosa, into which the amœbæ penetrate in large numbers, causing swelling and œdema of the tissue with subsequent necrosis. There is no real inflammation with any considerable growth of the tissue cells or emigration of the formed elements of the blood. The necrosis secondarily extends to the mucosa, and its result is the formation of ulcers. These ulcers, as a rule, have overhanging and swollen edges. The amœbæ were always found in the submucosa, never by Kruse and Pasquale in the mucosa. They lay in the interstices of the tissue between the cells and between the connective-tissue fibres. In all cases bacteria were associated with the amœbæ in the dysenteric ulcers, and it is suggested by the authors that certain of the structural changes may be the result of their action in association with that of the amœbæ. Small hemorrhages in the neighborhood of the ulcers were frequent. The most characteristic feature of the process is, however, the absence of inflammatory exudate, notwithstanding the often large size of the ulcers.

Fifteen cases of abscess of the liver were studied, in six of which a direct connection with dysentery could be made out. These all showed the presence of the amœba in the abscess; the other nine did not. Kartulis, to whom we owe a most exhaustive study of the Egyptian dysentery, found the amœbæ chiefly in the walls of the liver abscesses; Kruse and Pasquale found them only in the necrotic material filling the abscess cavity. Bacteria were present in five of the six dysenteric abscesses, in three of the idiopathic abscesses. In four of the eight cases in which bacteria were found they were streptococci. Two anatomical forms of dysenteric abscess of the liver are described, a cirrhotic form and a necrotic form. These are supposed to be in a measure dependent upon the age of the process, the formation of connective tissue in the cirrhotic form being regarded as an indication of healing of the process, since, after the disappearance of the amœbæ, the abscesses heal by cicatrization.

Kruse and Pasquale did not succeed in cultivating the amœbæ, and they are inclined to doubt the correctness of the culture experiments of Kartulis. They succeeded, however, in producing a lesion in cats somewhat similar to that observed in man, by the injection of feces and abscess contents containing amœbæ into the rectum and causing it to be retained there for from twenty-four to forty-eight hours. Of sixteen such experiments with feces,

eight gave a positive result; of seven in which abscess contents was employed, three were successful in producing the lesion. This consisted of a hemorrhagic catarrh of the lower portion of the colon, often accompanied by slight ulceration. In no case was there such swelling of the submucosa and such extensive ulceration as is observed in man. The amœbæ were found in the crypts of Lieberkühn in immediate proximity to the ulcers and in the tissue composing the floor of the ulcers. Thus, though the process in the cat differed somewhat from that in man, there could be no doubt as to the etiological relationship of the amœbæ to it. Similar injections with the common amœbæ of hay infusions and with the bacteria found in the feces and lesions of dysentery were without result in producing any similar lesions.

In closing, Kruse and Pasquale conclude that there are at least two quite distinct types of dysentery: the amœbic dysentery, which they have studied so carefully, which is especially prevalent in the tropics but occurs also in some parts of this country, in Italy, and in Bohemia, and the dysentery of the temperate climates, endemic in central Europe and in the United States and occurring also in epidemics. Of this last, two varieties are made according as the lesion is of a catarrhal or a diphtheritic nature. At present almost nothing is known of the etiology of the latter type.

Six excellent plates accompany this article, showing the structure of the amœbæ and their location in the various lesions.

Acute Yellow Atrophy of the Liver.

It has long seemed probable that this peculiar and extensive degenerative process of the liver is dependent upon the action of some infectious agent upon its tissues. The rapid clinical history, febrile course, great prostration, and frequent occurrence of embolic processes in connection with the disease lend weight to this view. It is, therefore, of considerable interest that Babès (*Virchow's Archiv*, 1894, cxxxvi. 1) describes four cases of virulent streptococcus infection which ran the typical course of acute yellow atrophy. In three of the cases the streptococci were present in the liver as well as in other organs, and in two of these were found in enormous numbers, blocking many of the smaller vessels of the liver completely, and so presumably aiding in the production of the degeneration. Babès suggests that a liver already weakened by the existence of some chronic degenerative lesion may lend itself particularly easily to the destructive effect of the streptococci and of their poisons.

Regeneration of the Liver after Injury.

In the absence of Ponfick, Foà demonstrated two rabbits at the International Medical Congress at Rome, from which Ponfick had twenty days previously removed about three-fourths of the liver. The animals appeared to be perfectly well in every particular. They were then killed and their livers were shown to have grown to nearly the normal size. In connection with his previous experiments of this sort, Ponfick has shown that the regeneration of the liver results from a growth of new liver-cells, which help to form a tissue very similar to that of the original liver.—*Centralbl. f. allg. Path. u. f. path. Anat.*

Suppuration.

The discovery by Ogston of micrococci in the pus of abscesses gave rise to the belief that suppurative inflammation was quite distinct in its nature from the more simple forms of inflammation, that it was a specific disease dependent upon a definite cause and not occurring without its agency. The researches of Koch into the infectious processes of wounds, and the more careful study of bacteria made possible by the use of solid culture media, however, disclosed the fact that several distinct species of bacteria were associated with pus-formation, and Koch consequently asserted that suppuration could not properly be considered a specific disease. Subsequent study has confirmed this opinion, and has demonstrated an etiological relationship to suppuration of a much larger number of bacteria than was at first supposed. The various problems connected with the occurrence of suppuration have thus become more complicated and have been the subject of much research during the past few years. The results of this study are carefully reviewed by Kurt Müller in a recent number of the *Centralblatt für Bakteriologie und Parasitenkunde*, 1894, xv., Nos. 19, 20, and 21.

While admitting that in a few instances inflammation with pus-formation has been produced experimentally without the agency of bacteria, Müller regards this to be of no practical importance, since suppuration as it occurs in man is unquestionably always the result of the action of micro-organisms. But the germs associated with suppuration are not the only factor to be considered in the study of its etiology, for the accumulation of the inflammatory products depends also upon the vital activity of the tissue upon which the influence of the germs is exerted.

The importance of the tissue in determining the occurrence of suppuration is shown by a number of circumstances. Thus, many germs occasionally producing suppuration, do not habitually do so, apparently only acting in this way when the state of the tissue is such as to react in an unusual way to their influence. The bacillus typhosus, the bacillus coli communis, and the micrococcus tetragenus are examples of germs occasionally acting to cause suppuration in this way. Again, it is not unusual to find inflammation of less intensity than the ordinary suppurative inflammation caused by the germs which usually cause suppuration in its most virulent form. The staphylococcus pyogenes aureus not infrequently causes simple serous inflammation (pleurisy with effusion), or may cause only areas of tissue necrosis at the points of its lodgment in the body. Another interesting fact bearing upon this question of the part played by the tissue in suppuration is that its susceptibility may change with great rapidity. A case illustrative of this is cited by Müller. A man who two weeks before had suffered from a suppurating wound of the finger, presented himself with diffuse infiltration and redness about the shoulder of the same arm. When incised a considerable quantity of serous exudate escaped, but no pus. Cultures of this serum showed only streptococci. The wound was dressed aseptically. In three days the man died, and at the autopsy the whole region previously occupied by a serous exudate was found to be infiltrated with pus, which still showed only streptococci. It would seem that in this case the tissues must have undergone a change of susceptibility.

A change of susceptibility is also observed with change in age of the individual. This is exemplified by "spontaneous" osteomyelitis which is comparatively rare after the twenty-fifth year. It is also strikingly illustrated in the case of rats, which while young are exceedingly susceptible to anthrax, but when adult show great immunity to it.

It is evident, then, that the condition of the tissues must exert an important action in determining the occurrence of suppuration.

The germs which have thus far been described as at times giving rise to suppuration are: Staphylococcus pyogenes aureus, albus, and citreus; streptococcus pyogenes, staphylococcus cereus albus, streptococcus cereus flavus, micrococcus pyogenes tenuis, micrococcus tetragenus, pneumococcus, bacillus pyogenes fœtidus, bacillus typhosus, bacillus coli communis, and bacillus pyocyaneus. Of these the staphylococci, streptococci, and the pneumococcus are by far the most frequent causes of suppurative inflammation. To these Müller would add, and apparently with justice, the bacillus tuberculosis, the gonococcus, and actinomyces.

Nothing can be more certain, then, than that suppuration cannot be regarded as a specific process. It results from the action of a great variety of microorganisms which are profoundly influenced in this action by varying states of the tissues. It must, therefore, be considered as nothing more than an intense form of exudative inflammation in which peculiar conditions of bacterial activity, or of tissue susceptibility, or of both, lean to an inordinate emigration of leucocytes and necrosis of tissue.

Stain for Gonococcus.

Lanz (*Deutsche med. Woch.*, 1894, No. 9) advocates the following method of staining the gonococcus in the various secretions. A cover-glass preparation, made in the usual way, is immersed for from one-half minute to two minutes in a 20 per cent. solution of trichloracetic acid and washed in water. It is then placed in the stain for from three to five minutes. This stain consists of 30 c.c. of water, 1 or 2 drops of a 5 per cent. solution of carbolic acid, and saturated alcoholic solution of methylene-blue in sufficient quantity to give the solution a deep blue color. After coming out of this stain the specimen is again washed in water, is dried, and is mounted in Canada balsam for examination. By this method the gonococci are said to be very clearly differentiated, as the color is prevented to a considerable degree from entering cells and other obscuring material by the previous soaking in the acid. Lanz says that very pretty pictures may be obtained by contrast-staining for a half-minute or so in Bismarck-brown.

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